GAS

OCTOBER 1958

The AGA Convention Issue

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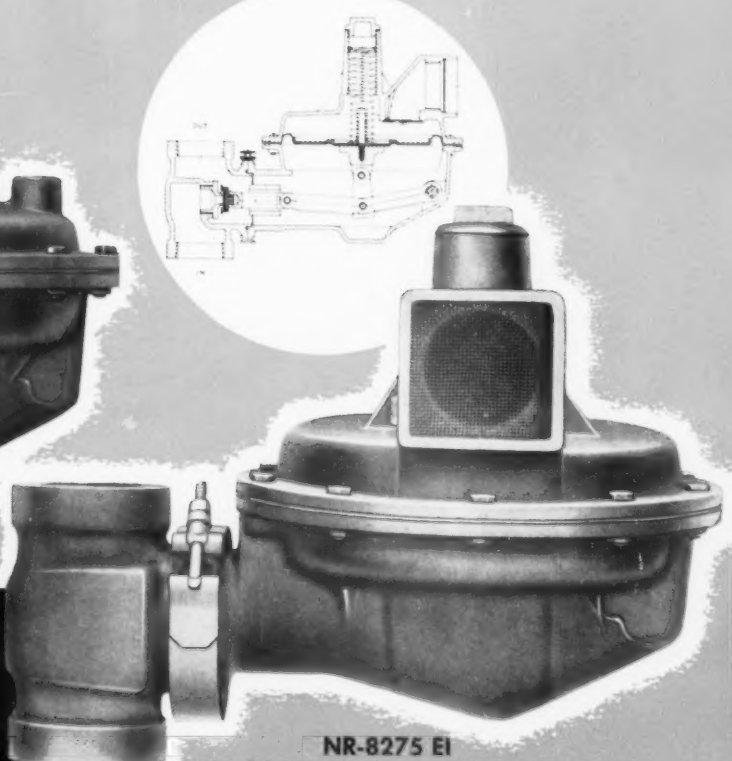

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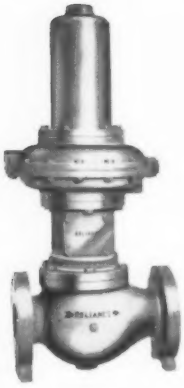

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BPA

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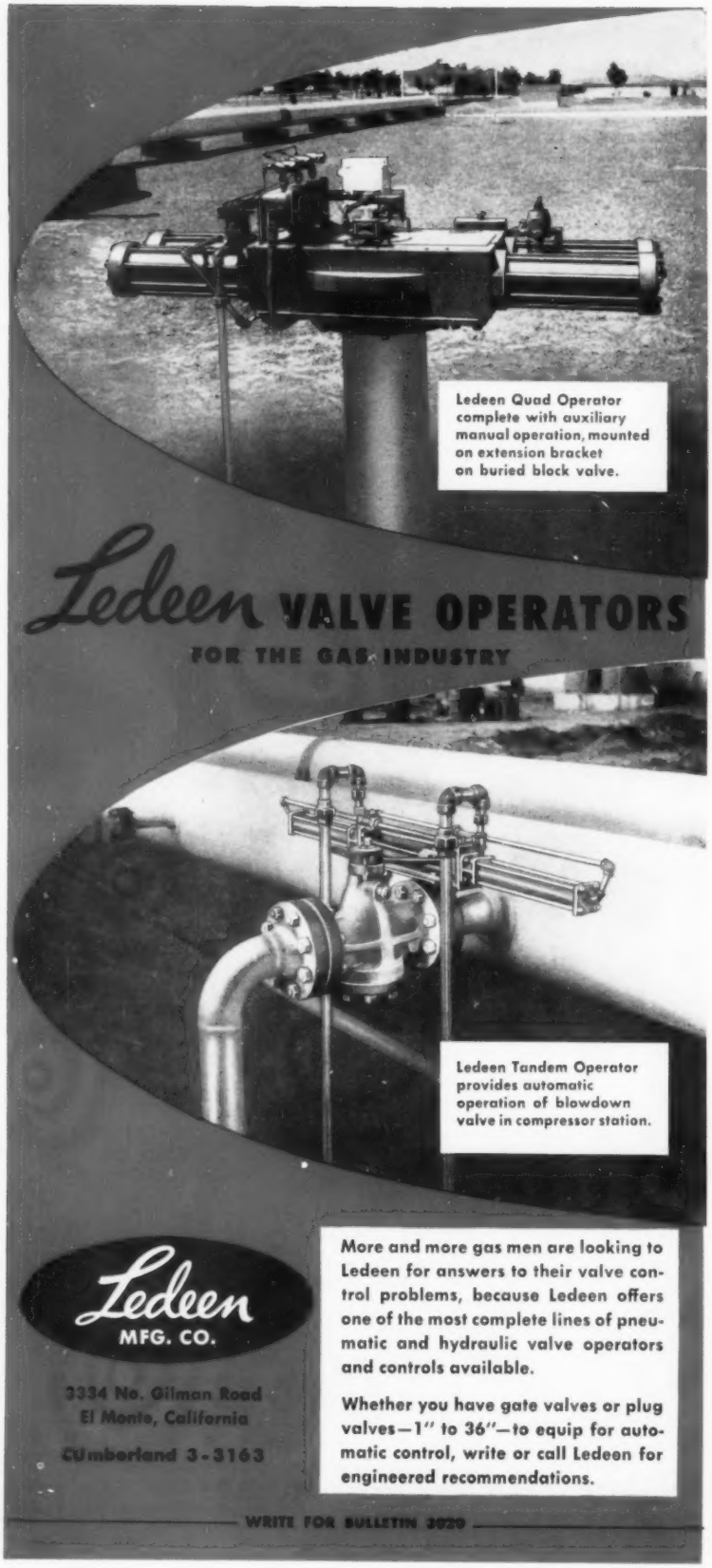
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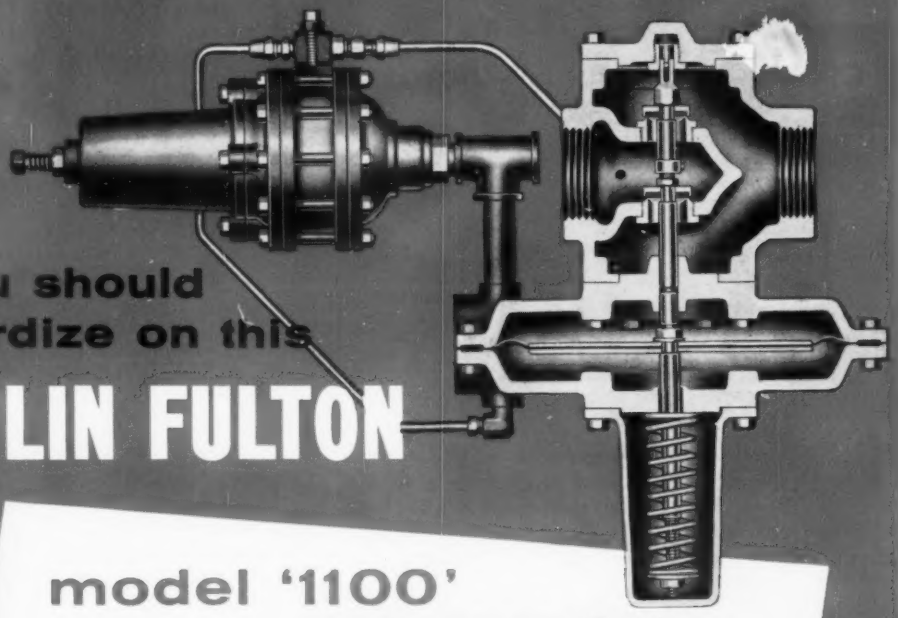

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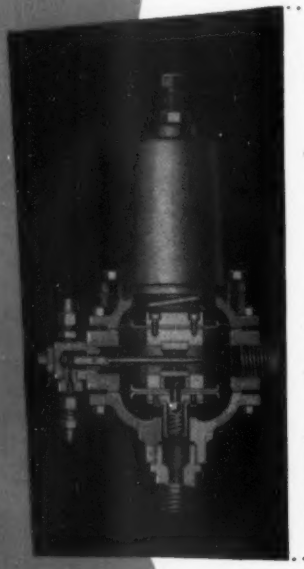

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GAS

OCTOBER 1958

Thermally Thinking

THERE has been a curious epidemic of hysteresis hysterics, blown fuses and short circuits among orators addressing business clam-bakes of disciples of Reddy Kilowatt. It seems some vague industrial group—the gas industry, I believe—has refused to roll over and play dead. It is now a gas industry that is promoting its product and gas appliances.

If one keeps his cranial receivers tuned on a proper frequency, he is apt to bring in such cacophony as:

"It is obvious the gas industry has developed a tremendous momentum in recent years."

"The electric appliance industry is in danger of being pushed off the map by a resurgent gas industry."

". . . our progress (the amperage empire's) in the important range market has been stopped. It is up to the electrical industry to reverse this trend."

This is a very comforting aria in the opera of appliance competition for gas people to absorb. However, it is well not to be lilted by this siren-call into the enveloping arms of apathy.

Our respected electrical competition is undoubtedly suffering from a malignancy of too much success coupled with the blow the entire appliance industry was staggered by during the recent or current (your choice) recession. But our friends will come off the mat swinging.

The gas industry has been more or less down the same road. We sat fairly still while the Kilowatt Corps sliced into "traditional" gas appliance markets for years. After reeling about much like a motor scooter caught in the Grand Prix, the gas industry came up with the winner—national gas-industry-sponsored promotion and advertising. It was and is a cooperative effort. An effort by a unified (on that point, anyway) gas industry. For the first time voices of gas producers, gas pipeliners, gas distributors, and manufacturers of gas appliances and system equipment were blended into a chorus that was heard and read throughout the nation.

And this unified effort is still going well. Our national television effort is rolling; we have the GEM program working for us; the "Super-X" barrage is being unlimbered; in short, we have a fine head of steam. But there is some difference between getting up steam and actually high-balling.

For one thing, I have never heard anyone from GAMA or anyone associated with PAR Plan mention that they were overwhelmed with resources. In fact, gas company affiliations represented by individual readers on GAS Magazine's circulation lists number more than seven times the number of gas companies that are subscribers to PAR Plan.

Such things as national advertising and promotion tend to become static without increasing support. After the static state is reached, they may as well be defunct. Now that we see the power industry hollering for its boys to rally 'round the high-tension flag, it seems astute for "our side" to do still more.

Thinking just in terms of Playhouse 90 (at the expense of many other fine plans, programs and promotions our industry has), here is a flag around which we can do some really high-class rallying. Playhouse's products are way out in front. Granted it produces a clinker on occasion, but this program leaves the average TV serving wondering which way it (Playhouse 90) went. And the disarmingly erect stance and beguiling lisp of redhead Julia Meade are convincing our public, at least, that gas is the modern energy source for fully automatic appliances.

It is now time to exploit gains through additional support and, again, intelligent placement of the resources in carefully selected, visual, spoken and printed media. We have corrected some misconceptions, and sold our product and appliances—but we have not done nearly enough.

There are other important problems within the gas industry. (While we are on that subject we may as well go on record with our prediction that the Memphis decision will be overturned by the Supreme Court.) However, I think our industry, problems and all, is entering a new era. It is hoped that all entities of the gas industry will back their industry in its efforts to advance during this new phase.

J. Fred Ebsen
EDITOR

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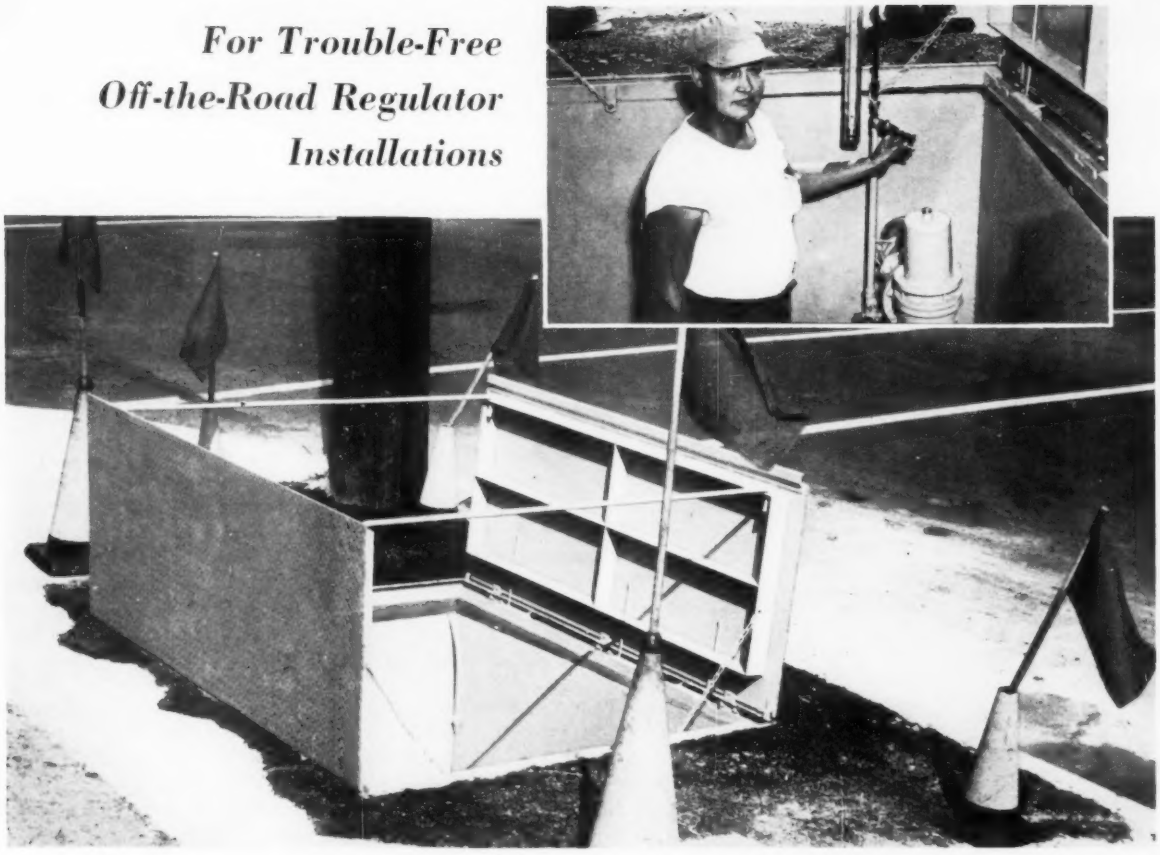

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GAS HIGHLIGHTS

Research scores again

Delegates to AGA's Atlantic City convention will be treated to dynamic results of research this month as Whirlpool Corp. unveils its Miracle Gas Kitchen. New—a gas-fired power burner (can be housed in a kitchen base cabinet) which, through gas combustion, provides energy for various kitchen needs and for heating, cooling, and air purification.

Transco is building away

Transcontinental Gas Pipe Line does expect to meet its commitments for gas deliveries this winter to customers in the New York City-New Jersey-Philadelphia and other areas. Work is underway to expand facilities to deliver 190 MMcf per day additional. The over-all plans involve construction to cost $167 million. Transco's president E. Clyde McGraw said they had pipe, equipment and contractors on job sites and poised for the "word." When the FPC certificate was handed down, Transco immediately gave the go-ahead to the field. Somebody out on the spreads may get a little cold and wet—but 28 of Transco's existing customers will get more gas this winter. (See Pipeline News.)

And that ain't hay

GAMA's president Clifford Coons told the Pacific Coast Gas Association that the gas industry will show its confidence in the nation's economy by spending $30 million in the immediate future for local-level advertising and promotion—this about triples the average annual outlay for these purposes. Focal point will be the new "Super-X" top-of-the-line gas range. "Appliance manufacturers have been hit hard by the recession," Coons said, but ". . . a new era in progress has begun." He predicted that the "Super-X" designation will identify all high-quality gas appliances and equipment for the home, in the future.

They're waiting for it

Northern Illinois Gas Co. reports 75,000 domestic customers are on their waiting list for gas heating service. And new homes are being built at the rate of 2500 per month. They hope to get additional 50 MMcf per day from Northern Natural via the latter's FPC application, Docket G-14,697. Backlog of heating applications leaves builders of new homes in a quandary over the selection of heating service.

Jingle Bells already

And not too soon for starting that Christmas gas appliance push. Bing did it for the gas industry last year, this year Hollywood's popular husband-and-wife team—June Haver and Fred MacMurray—will be thumping the tub for gas appliances.

Hello Miami Beach!

Construction is booming ahead on the Texas-to-Florida pipeline of The Houston Corp. A check for over $52 million was handed over by New York investment bankers to put the Coastal Transmission and Houston Texas Gas & Oil (both now owned by The Houston Corp.) plans into reality at last. Original applications for the line were filed in Aug. '55 and Feb. '56. The spreads are working and can continue to do so in the mild climate the pipeline route traverses. Initial cost of the transmission project: $161 million, plus. Plans to later boost the delivery capacity from the initial 282 MMcf per day to 411 MMcf are estimated at another $41 million.

They'll move to Florida

To be executive vice president of Houston Texas Gas & Oil Corp. and Coastal Transmission Corp.—Dwight Sprow; to be superintendent of pipelines—Don Hardesty; to be compressor station superintendent—J. B. Zachry. Sprow and Hardesty—both top gas industry executives—come from Natural Gas Pipe-Texas Illinois; Zachry from 23 years with Worthington Corp.

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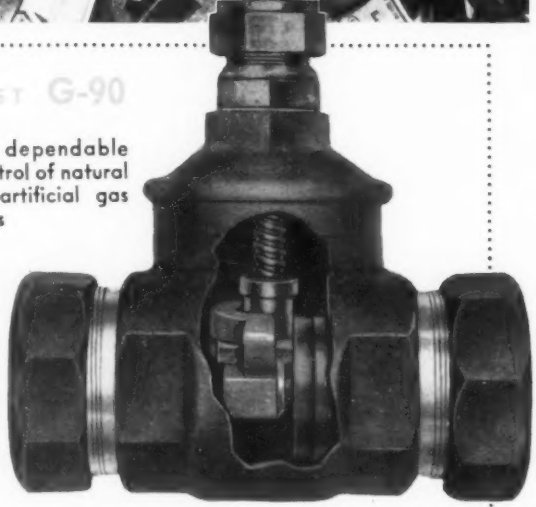

Above: 2-inch valve showing Dresser coupling assembly and internal wedge and gate mechanism.

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VALVES AND HYDRANTS

THE LUDLOW VALVE MANUFACTURING CO., INC., TROY, N. Y. SINCE 1861

Boiler fuel gas gets a ride

A STARTLING and significant development confronts Congress and the Federal Power Commission. More and more electric companies are buying natural gas in the state of origin, and then paying interstate pipelines to transport it to their steam electric generating stations for use as boiler fuel. Gas producers like such sales because they are exempt from FPC price regulation. Electric utilities like these transactions because they obtain a reliable, long-term gas supply.

In a recent decision an FPC examiner authorized such an arrangement over violent objections. The examiner answered those who complained that natural gas for boiler fuel is an inferior use, by saying: "The commission, however, has no legal basis for inquiry into the merits of the proposed end use so long as that use has no relationship or effect upon consumer service stemming from jurisdictional natural gas." The examiner added that "If there is something inherently harmful to the public about such activity, it is the function of Congress, not this commission, to take steps to provide for regulation of it, or even to prohibit it."

Since there is inadequate recoverable natural gas in the United States to meet the growing demands, conservationists may consider it time to request Congress to amend the Natural Gas Act to provide FPC regulation of direct industrial sales, such as these boiler fuel sales by independent gas producers.

• FPC and end use

The FPC is divided on whether it has the authority to consider the end use of gas. Some commissioners have stated that Congress gave no authority to FPC to make a national plan for conservation of natural gas. They assert that this inherent power rests solely within the states where the natural resource is found.

Other commissioners have considered that natural gas should be conserved for the superior uses of residential and industrial customers rather than burned as boiler fuel when coal or oil is available. The majority of the five members on FPC have declared that "there is no valid objection to giving matters of conservation, inferior and superior uses and related matters the weight they may deserve on the facts of a given case, short of assigning to them alone determinative weight. These also are factors to be weighed and evaluated along with other relevant circumstances in assaying the public convenience and necessity. And we have repeatedly held that the use of natural gas as a boiler fuel is an inferior usage, and that while it is not to be denied in all situations, it should be permitted only on a positive showing that it is required by public convenience and necessity."

• The examiner's gas light

The examiner's views in the light of this gas case are worthy of observation. He has placed the case in a position to require a policy announcement by the present commissioners. One new commissioner has not had an opportunity to express an opinion on the use of natural gas as boiler fuel.

The examiner made the following statements concerning the arrangement which comes under FPC regulations of the charge for transporting the electric company's gas from Texas to New York:

Consolidated Edison contracted to purchase gas from producers in Texas at 19.25 cents per Mcf. This gas was purchased from producers who restricted its use to electric generation and with the understanding that it would not be resold. There are no escalation, price re-determination, or favored nations clauses in the contracts. The contracts call for a daily take-or-pay of 50 MMcf.

Consolidated's proposed arrangement with Transco calls for this transportation arrangement to be discontinued for as many as 60 days each year, during which Transco will furnish 50 MMcf on a firm basis to Consolidated Edison for general gas system use, including resale. This is referred to as "consumer gas" as opposed to "transportation gas." When Consolidated Edison's own field purchases are curtailed, it is necessary for these curtailments to be made up later in order to comply with the Consolidated Edison-producer contracts.

The gas purchased by Consolidated Edison from Transco will be purchased for 34.23 cents per Mcf. The transportation charge to Consolidated Edison for gas from Consolidated Edison's sources will be 23.38 cents.

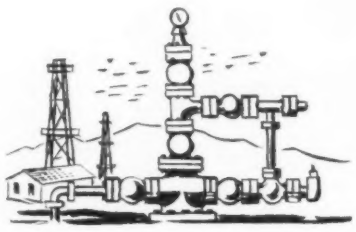
Testimony in the record reflects the belief of an expert that the presently proven reserves contracted to Consolidated Edison could be maintained at the rate of 50 MMcf per day for about 19 years.

Consolidated Edison's purpose in bringing this arrangement to a successful conclusion is its plan to reduce stack emissions from its Waterside steam-electric plant in mid-town New York City. These emissions have been a constant source of irritation to the neighborhood in which the United Nations maintains its world headquarters.

At average annual boiler output the stacks at Waterside emit 1121 lb of fly ash per hour which includes approximately 269 lb of carbon. Boilers release approximately 42,000 lb of sulfur dioxide into the city's atmosphere each day. It is in these boilers that Consolidated Edison plans to burn natural gas on a firm basis throughout the year.

There are two objectors to this boiler fuel transportation matter. The coal and labor interests are "deeply disturbed over the proposed displacement of coal in the Waterside plant" for economic reasons. Nearly a million tons of coal are burned at Waterside No. 2 annually, and between half and three quarters of that amount will be displaced. Secondarily, the coal and labor interests recoil at the prospect of natural gas, a premium fuel, being used in great quantities for such an inferior use. This, it is urged, is in complete conflict with an enlightened conservation policy. The coal interests' brief also points out that there are numerous ways Consolidated Edison could alleviate the smoke nuisance of boilers if it chose to, and that it could be done at less cost than is estimated by Consolidated Edison.

The FPC staff's opposition to the proposed service is based upon the following reasons: Consolidated apparently is not violating the standards set up in the New York City ordinance, but merely the indefinite nuisance provisions; no statistical evidence of the alleged harm to persons or structures is available; Consolidated has been aware of this problem for many years, but has made no plans to shift the load to other and newer stations, thus relieving the conditions at the offending stations; the proposal partially nullifies the benefits to be derived from the proposed storage of gas in the summer in the Leidy storage field and its withdrawal in the winter for superior uses, such as domestic and commercial consumption; the proposal is obviously an attempt to evade the jurisdiction of the commission over the sale of natural gas for use in the large consuming centers of the country and thus may be contrary to the public interest; the purchase of natural gas by a consumer and transportation for that ultimate consumer may make it difficult for pipeline companies to purchase gas at reasonable prices for resale to other customers who require the gas for superior domestic and commercial uses and thus may be contrary to the public interest; it is in the public interest to conserve natural resources for the use of the many customers who require natural gas for such superior uses as domestic and commercial fuel instead of abatement of a nuisance for the few, which could be cured by other means.



Consolidated Edison in answer to these objections points out that if this Texas gas were not to be used in New York City for boiler fuel, it is probable that it will not be transported anywhere in interstate commerce, and indeed it might even be used in Texas as boiler fuel, since the space heating and domestic market in Texas is supplied. The major point made by Consolidated Edison is that this arrangement is really not the concern of the commission except in that Transco's jurisdictional sales service or capacity might be impaired or adversely affected.

There is no true basis for inquiry as to whether Consolidated Edison's proposed use of this natural gas is in the public interest or not. Consolidated Edison purchases this gas in the fields in Texas. Were it authorized by its charter, it could, conceivably, use this gas in Texas. Obviously, the commission would not be concerned with such use. Consolidated Edison, however, has chosen to transport this gas to New York. Conceivably it might have liquefied the natural gas and transported it to New York by refrigerated barge or tank car. The commission would have no interest in such an arrangement, nor to any end use Consolidated Edison might make of such gas. The method by which Consolidated Edison has chosen to transport its gas is by means of Transco's pipeline, in space which is being built into the Transco facilities for this purpose. Consideration must be given to pipeline capacity, and consideration must be given to the charge or rate to be made for this service. The commission, however, has no legal basis for inquiry into the merits of the proposed end use so long as that use has no relationship or effect upon consumer service stemming from jurisdictional natural gas.

There is no evidence of any adverse effect by reason of this proposed transportation service on any of Transco's regulated activities and it must be approved in principle.

In the event the commission does not agree with the examiner's legal conclusion which eliminates inquiry into the public interest aspect of the end use, the following findings are made. Such findings are presented so the commission will have the examiner's views if desired without necessity for remand.

If the commission has authority to inquire into the public interest aspect of this proposed boiler fuel use, it would appear that Consolidated Edison and Transco have not sustained their burden of establishing that this service is required by the public convenience and necessity, and this aspect of the certificate sought should be rejected, concluded the FPC examiner. ■

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TECHNICAL TRENDS

By GUY CORFIELD

The fuel cell

In an earlier item on this page (December 1957) the fuel cell was mentioned as a scientific possibility. The essential concept was a "battery" into which gaseous fuel would be fed to one electrode and oxygen to the other. The two gases would unite and "burn" without flame but with direct production of electric energy which could be withdrawn from the two external terminals.

As often happens in this age of technical miracles, it has already been announced that the fuel cell has been developed as a usable source of electricity. This has been accomplished by the National Carbon Co. and the first use is by the Army, to power a portable field radar assembly. For this purpose it has the advantage of complete silence, whereas electric generators would betray the radar equipment to the enemy.

The cell consists basically of two sets of specially chemically treated hollow carbon rods (electrodes) surrounded by potassium hydroxide solution. Hydrogen is fed into one set of rods and oxygen into the other set. The gases seep through the carbon and react with the potassium hydroxide and each other to produce a potential between the two sets of rods with resulting current flow in a completed external electrical circuit. Water is the end product, and flows out of the bottom of the tubes into which hydrogen is introduced.

This National Carbon cell will, theoretically at least, last and produce electricity indefinitely if it is fed with hydrogen and oxygen. This is in contrast with the familiar wet storage battery which deteriorates internally, and the dry battery which fails when its chemical charge is consumed. The fuel cell is said to be about 75 per cent efficient—about double the approximate 35 per cent maximum fuel efficiency of a steam-electric generating plant. A single cell produces approximately one volt, and current output proportional to its size. About 1 kw of power can be obtained from an assembly 1 cu ft in volume. By series and parallel combination of cells, various voltages and amperages will result, but the best performance is said to be at low voltage and high current output.

The fuel cell's practical drawback is, of course, the need for a supply of hydrogen and oxygen gas. This limits it at present to special applications such as the military use already cited, and standby where nondeterioration is a prime factor. However, wider uses are already visualized. It could be a means of converting solar energy to electric power, through the route of decomposition of water by sunlight and re-combination of the resulting hydrogen and oxygen. It could be a means of *storing electricity*, whereby off-peak or surplus electric energy could also decompose water to hydrogen and oxygen, which the cell would convert back to electricity for peak use.

It has already been determined that the fuel cell will operate, at reduced capacity, on impure hydrogen, and air instead of oxygen. This indicates a potential ability to consume other gases. It does not seem beyond possibility, or even probability, that it *can be developed to use natural gas and air!*

Thermistors

Thermistors are temperature-sensitive semi-conductors which change their electrical resistance with change in temperature. But their behavior is the reverse of metallic conductors or resistors because they increase their resistance with a drop in temperature, and decrease resistance when heated. Also their change in resistance or conductance per degree of temperature change is many times greater than in a metallic conductor. They consist of oxides of manganese, nickel, cobalt, copper, iron and uranium, each having specific properties and applications. They are used in a variety of forms and shapes such as beads, discs, wafers, washers, flakes and rods.

Thermistors, because of their temperature sensitivity, are used in a variety of temperature measurements. A familiar use is to actuate the engine temperature dial on the automobile instrument panel. Another is the new roast meat control in gas ranges. They have wide use in aircraft and missiles. Their peculiar negative coefficient of resistance permits application to numerous time delay, amplifier output control, and heat anticipation functions.

As a time delay control, resistance is high and current flow low when voltage is first applied, but as the thermistor heats its resistance decreases and current rises to the actuation level. As an example of heat anticipation, one of the well known control manufacturers has recently announced a simple electrical control for gas furnaces whereby the set indoor temperature is automatically raised as outdoor temperature drops, and vice versa. The outdoor thermostat is a thermistor which by its varying resistance controls electric current which heats the body of the indoor thermostat. As the outdoor temperature falls the resistance of the thermistor increases, which reduces the heating current and causes the indoor thermostat to call for higher heat to counteract the discomfort of cold walls; the reverse effect is produced as the outdoor temperature rises.

Thermistors and their performance have been known for a century, but have only been put to practical use in comparatively recent years. It is believed that their applications will be greatly expanded as their functions become better known.

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GAS CALENDAR

October

9-10 . . California Natural Gasoline Association 33rd Annual Fall Meeting—Huntington-Sheraton Hotel, Pasadena, Calif.

13-15 . . American Gas Association Annual Convention—Atlantic City, N. J.

15-16 . . Sixth Gas Measurement Institute (sponsored by University of Kansas and Southwest Kansas Petroleum Industry)—National Guard Armory, Liberal, Kan.

15-17 . . Wisconsin Utilities Association Electric & Gas Sales Operating Convention — Hotel Schroeder, Milwaukee.

20-24 . . National Safety Council—Chicago.

23 . . NEGA Home Service Group—Publick House, Sturbridge, Mass.

23 . . AGA-Mid-West PR Workshop—Hotel Sheraton - Martin, Sioux City, Iowa.

24 . . Oklahoma Utilities Association Accounting Section—Burlingame Hotel, Bartlesville.

30 . . New England Gas Association Operating Division — Sheraton-Kimball, Springfield, Mass.

31 . . New England Gas Association Accounting Division—Statler Hilton Hotel, Hartford, Conn.

November

10-12 . . American Petroleum Institute Convention—Palmer House, Chicago.

17-18 . . Southern Gas Association Annual Advisory Council & Management Conference—Point Clear, Ala.

17-20 . . NARUC Annual Convention—Hotel Westward Ho, Phoenix.

19-20 . . Joint Fall Administrative Services Conference, PCGA and PCEA—Claremont Hotel, Berkeley, Calif.

19-21 . . Mid-West Gas Association Gas Meter & Service School and Conference — Iowa State College, Ames.

20 . . NEGA Manufacturer-Distribution Division (Customer Service Manager Group and Sales Managers Conference) — Bancroft Hotel, Worcester, Mass.

December

30- 5 . . American Society of Mechanical Engineers Annual Meeting—Statler Hotel, New York.

7- 9 . . Institute of Appliance Manufacturers Year-End Meeting—Statler-Hilton Hotel, Dallas.

30 . . Rocky Mountain Gas Association Annual Meeting—Denver, Colo.

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Knox, Ind.
Norwalk, Ohio
Pittsburgh, Pa.
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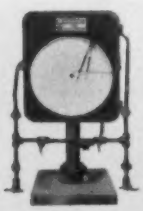

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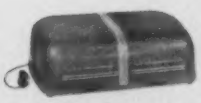

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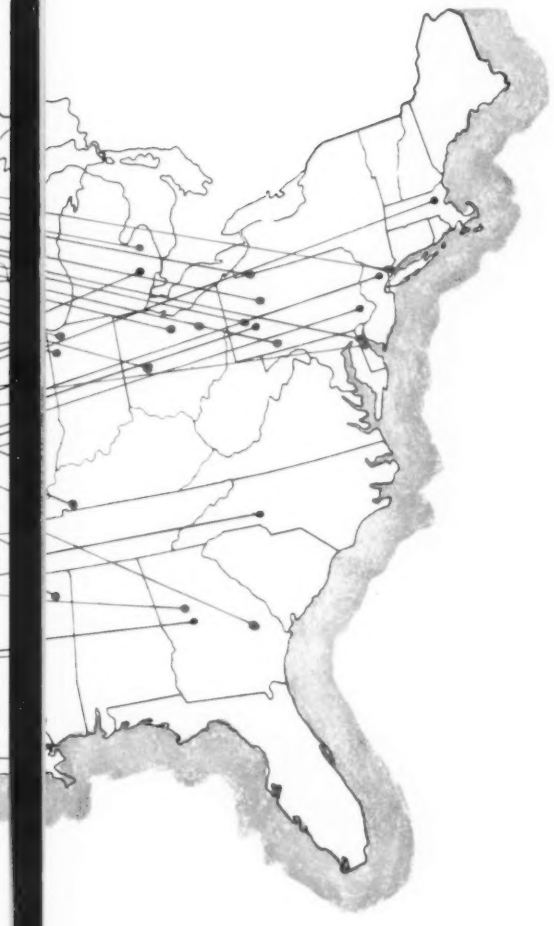

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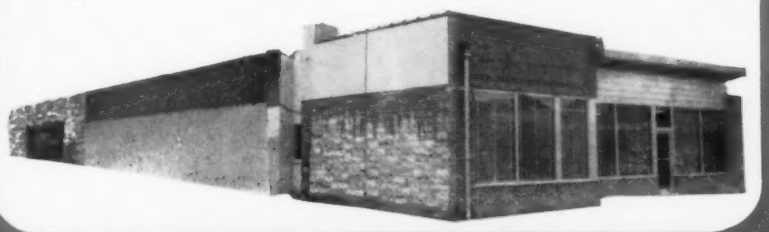

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by Phil Tration

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WASHINGTON

By NEIL REGEIMBAL
GAS Washington Bureau

Vote-getting promises may hurt

RECENT congressional campaign oratory around the country bodes little good for the gas industry.

Gas distributors, as well as the other segments of the industry, are beginning a new heating season with strong prospects of higher prices and more difficulty securing new sources of supply over the next few years.

An increasingly large number of would-be members of the new Congress, which will convene next January (the 86th Congress) for two years, are promising constituents they will vote against any gas decontrol measure—"consumer gouge bills," as the eager campaigners are apt to call them.

Many candidates, according to reports reaching the gas industry in Washington, are also lining up behind a cut in gas and oil tax depletion allowance.

Failure of gas legislation, reduced depletion allowances, and possible refusal of the U. S. Supreme Court to reverse the Memphis decision, will put the squeeze on distributors again. With long delays the rule in most areas when distributors attempt to get local regulatory agency approval to pass along higher costs, the outlook isn't too rosy for local utilities.

These problems are intensifying at a time when the gas industry faces probably its greatest expansion potential.

There is a real possibility that the Supreme Court, which convenes this month, will uphold the lower court in the Memphis case. This would seriously damage many pipeline expansion plans, throw a large monkey wrench into pipeline and perhaps other gas industry financing, and force pipelines and a lot of distributors to make huge refunds on rates collected over the years by procedures the Memphis decision outlaws.

Protestors in the case, including the Federal Power Commission and United Gas Pipe Line Co., have filed their initial arguments with the high court. The case will be heard this fall.

If the lower court order is upheld, FPC says, it would result in "grave inequities (which will) ultimately hurt the consumer."

The FPC argued to the High Court that three alternatives under which pipelines may secure rate increases if the usual method outlawed by the Memphis decision remains stricken, won't solve the problem.

One alternative, FPC contends, would be for a pipeline to negotiate separate contracts with each purchaser. To this, there are "virtually insurmountable obstacles," including the possibility that prohibitions against discriminatory rates would be violated, the agency says.

Another possibility, under which the pipeline can negotiate agreements with all customers before a rate hike is requested, similarly would be "difficult if not impossible" in most cases.

"It is unreasonable to expect that lending institutions will generally be willing to provide funds of the magnitude required if the borrower's ability to obtain increases in revenues is dependent upon the weak reed of cooperation by purchasers and local regulatory commissions throughout the life of the loan," the FPC points out.

The final alternative to the old method is the weakest of the bunch, FPC argues. Under this system, the commission on its own motion is empowered to find certain rates in error and then proceed to set "just and reasonable rates." Normally, this action by the FPC would lead to a rate reduction, although there's no ban on it producing higher rates.

But it is "wholly unrealistic to expect action with sufficient speed to prevent any substantial lag between the incurring of increased costs and the receipt of the additional revenues to cover these costs," the commission, through Solicitor General J. Lee Rankin, protests.

Under the procedure in dispute, a pipeline company normally would file higher rates with the FPC, opponents would object, and eventually the FPC would decide the issue. In the Memphis decision, the Court of Appeals held that this procedure could be used for rate increases only where all customers of a pipeline agreed to the boost in advance.

"The effect of the (Memphis decision) is to bar the pipelines from utilizing the means best calculated to give them the necessary rate flexibility while protecting the public interest, and to remit them to inefficient alternatives which will impair their ability to provide needed increases in gas service," the commission says.

In addition, the FPC contends that the present prohibition against use of established rate raising procedures will, if upheld, "create a serious obstacle" to purchases by pipelines of additional gas supplies because of constantly rising field prices of gas. It would also create a deterrent to new pipeline construction "demanded by growing consumer needs," the FPC insists.

At present, FPC is continuing to approve pipeline rate boosts under

Continued on page 104

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By MARSHALL E. PARKER

Attenuation consistency tests

WHEN current requirement tests are conducted on long uniform pipelines, there are four basic electrical quantities involved:

r = the longitudinal resistance, *ohms per megafoot*

k = the leakage conductance, *mhos per megafoot*

a = the attenuation constant, *per megafoot*

R = the input resistance, *ohms*.

Note: one megafoot = 1 million ft. This distance is used as a unit only because it yields figures of a convenient size for most pipelines. It is not necessary that the line actually be as long as one megafoot, which is about 190 miles.

These four quantities are not independent; r and k are physical properties of the particular line, and r may be measured directly, or computed. The attenuation constant, a, is defined by

$$a = \sqrt{r\,k}.$$

In practice, a is determined from the slope of the attenuation curve. Two points are selected on the curve of ΔE against distance along the line, far enough from the ends to avoid either the anode proximity effect or the end effect; then the quantity ax is the natural logarithm of the ratio of the two values of ΔE; or,

$$a = \frac{(\log \Delta E_1 - \log \Delta E_2)}{(x_2 - x_1)}$$

The input resistance, R, is the resistance of the line to remote earth as "looked at" from a given point, "looking" in one direction only. It is determined by the ratio

$$\frac{\Delta E_0}{\Delta I_0}$$

where ΔE_0 is the change in potential with respect to remote earth caused by the change ΔI_0 in current drained from one direction. In practice it is frequently determined by projecting the attenuation curve back to the point of drainage.

When the line is electrically "long," R is given by

$$R = \sqrt{\frac{r}{k}} = \frac{r}{a} = \frac{a}{k}$$

the three expressions are identical A line may be considered is be "long" if the attenuation curve is essentially straight on semi-logarithmic paper. When the line is not so long, we have

$$R = \sqrt{\frac{r}{k}} \coth aL. = \frac{r}{a} \coth aL. = \frac{a}{k} \coth aL.$$

again, these three expressions are equal.

This combination of relationships affords an opportunity for an internal consistency check which is often quite valuable. R can be determined in two entirely different ways; one, by calculation from r and k; and again by direct measurement of E_0 and I_0. If these two values do not agree, the discrepancy indicates something of the quality of the work. If it is small, it can, of course, be attributed to experimental error; but if it is large, an explanation must be sought elsewhere. An example follows:

An interrupted current of 4.0 amp was drained from one end (insulated) of a long 6-in. coated line. A storage battery was used for power, and an abandoned steel light standard about 80 ft from the line was used as an anode. At a distance of 1200 ft, a potential shift of 156 mv was obtained; at a distance of 16,800 ft the shift was 120 mv. Other values were obtained at greater distances, but they all fell on a very good straight line; hence the line could be considered "long" and the two values given, since they determine the slope, suffice for the test. The question now is, are the values obtained consistent?

The resistance of this pipe is known to be r = 13.35 *ohms per megafoot*. We can now compute

$$a = \frac{\left(\log \frac{156}{120}\right)}{(0.0156)} = 16.82 \text{ per megafoot.}$$

$$k = \frac{a^2}{r} = 21.20 \text{ mhos per megafoot.}$$

$$R = \frac{r}{a} = 0.63 \text{ ohms.}$$

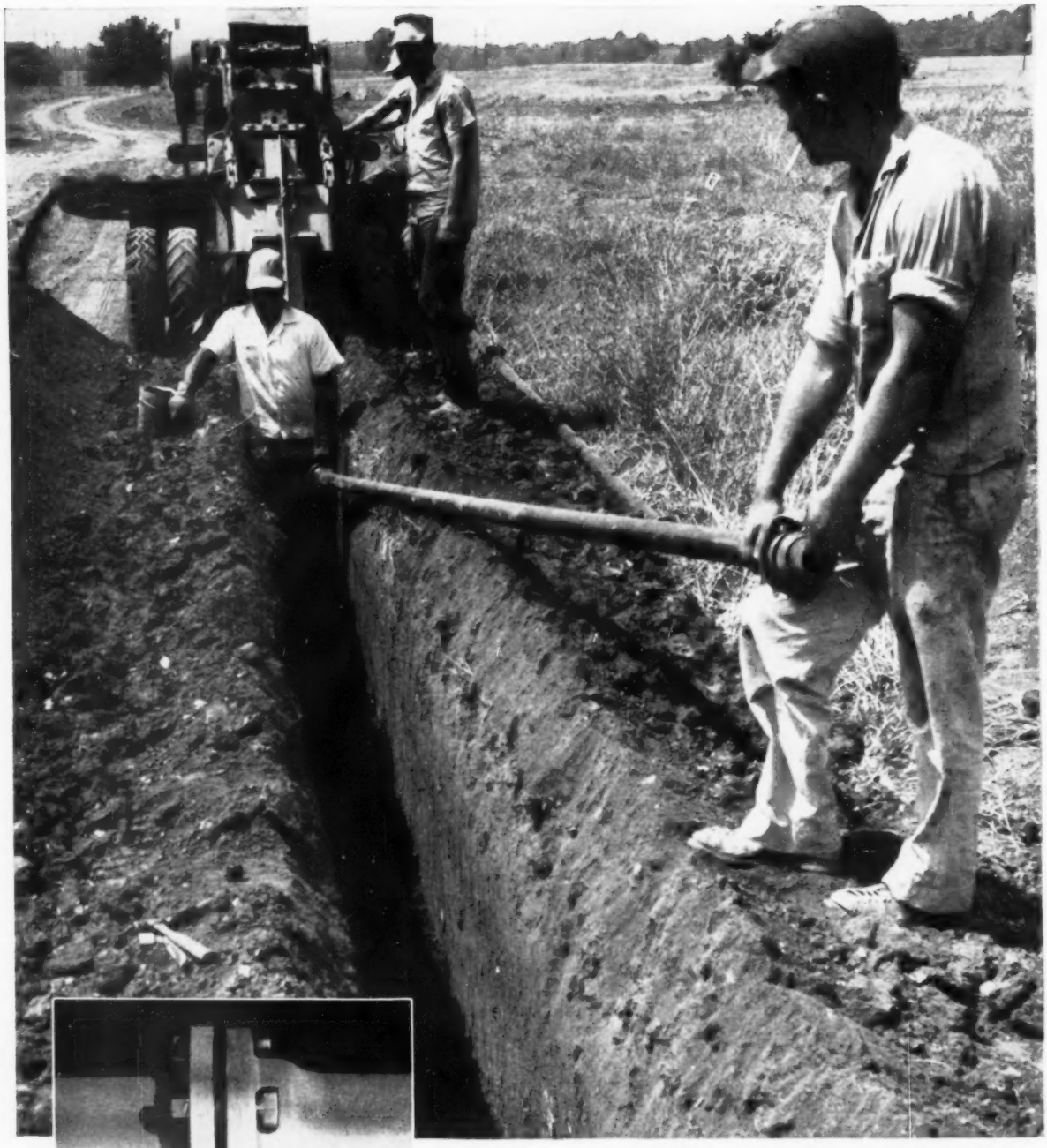
But, if we project the straight line of attenuation back to the origin, we will obtain a value of 160 mv for ΔE_0. Then we will have

$$R = \frac{\Delta E_0}{\Delta I_0} = \frac{0.160}{4.0} = 0.04 \text{ ohm}$$

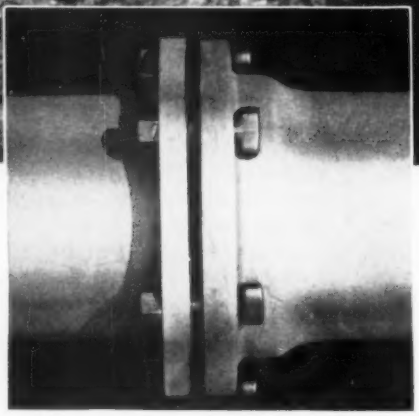
This value is only about *one-sixteenth* as great as the one obtained from the attenuation data. As mentioned before, there were several additional points on the curve, all falling on a very good straight line; so apparently the attenuation data are valid. In other words, once some kind of protective potential has been established on the line, it does not diminish very rapidly as the distance increases. This indicates very good coating. Why, then, does it take so much current to establish a potential shift at the drain point?

Without this consistency test, a protective system might have been designed for this line, based solely on the amount of current needed to obtain the required potentials. Such a system would have called for the drainage of 15 or 20 amp, and this would have been found to be far more than was needed. The consistency test tells us that something is wrong. Since there are no breaks in the slope of the curve, the trouble must be at the end of the line. The far end was checked and found clear and insulated. The

Continued on page 135



Installing a Cast Iron Pipe gas line for a subdivision in booming Huntsville, Alabama.



CAST IRON

Cast Iron Pipe Research Association, Thos. F. Wolfe, Managing Director, Suite 3440, Prudential Plaza, Chicago 1, Ill.

MECHANICAL JOINT cast iron

the first 100 years are the easiest

dependable Cast Iron Pipe is built to last

Every year more gas companies join the Century Club, that unique organization whose membership is limited to water and gas companies whose cast iron mains have served communities a century and more.

57 American gas companies now belong. Hundreds more can point to mains with over fifty years of service.

And *modern* cast iron pipe, centrifugally cast, is even tougher . . . gives even greater promise of service.

Specify cast iron pipe and dependability, strength and long term economy make the first hundred years easy.

A FEW OF THE 57 GAS UTILITIES WITH CENTURY-OLD CAST IRON MAINS IN SERVICE

Baltimore Gas and Electric Company, Baltimore, Maryland — Citizens Utilities Company, Gas District, Bangor, Maine — The United Gas Improvement Company, Bethlehem, Pennsylvania — Boston Consolidated Gas Co., Boston, Massachusetts — Public Service Electric & Gas Co., Bound Brook, New Jersey.

MODERN CAST IRON PIPE IS EVEN MORE EFFICIENT

- Centrifugally cast, it's tougher, stronger, more uniform.
- Standardized mechanical joints are bottle-tight under all gas distribution pressures . . . for all types of gas.
- Uniform wall thicknesses.
- Joint design allows deflection during and after installation.
- Service lengths and variety of standard fittings cut time and labor in congested undergrounds.

pipe FOR MODERN GAS DISTRIBUTION

Pipe coatings "stick around" permanently when Rudy Komnenovich is on the job. Rudy's years of experience as a coating machine operator give him the "know how" that's needed to do the job *right!* Because of Rudy, and the men who work with him, the Hill-Hubbell name has become the most respected in the pipe coating and wrapping industry. Hill-Hubbell's factory trained craftsmen make it *their* business to give your pipe perfect protection . . . permanently! So, for the guaranteed precision of factory application and factory-control by experts . . .

Specify Hill-Hubbell wrapped pipe on your next job

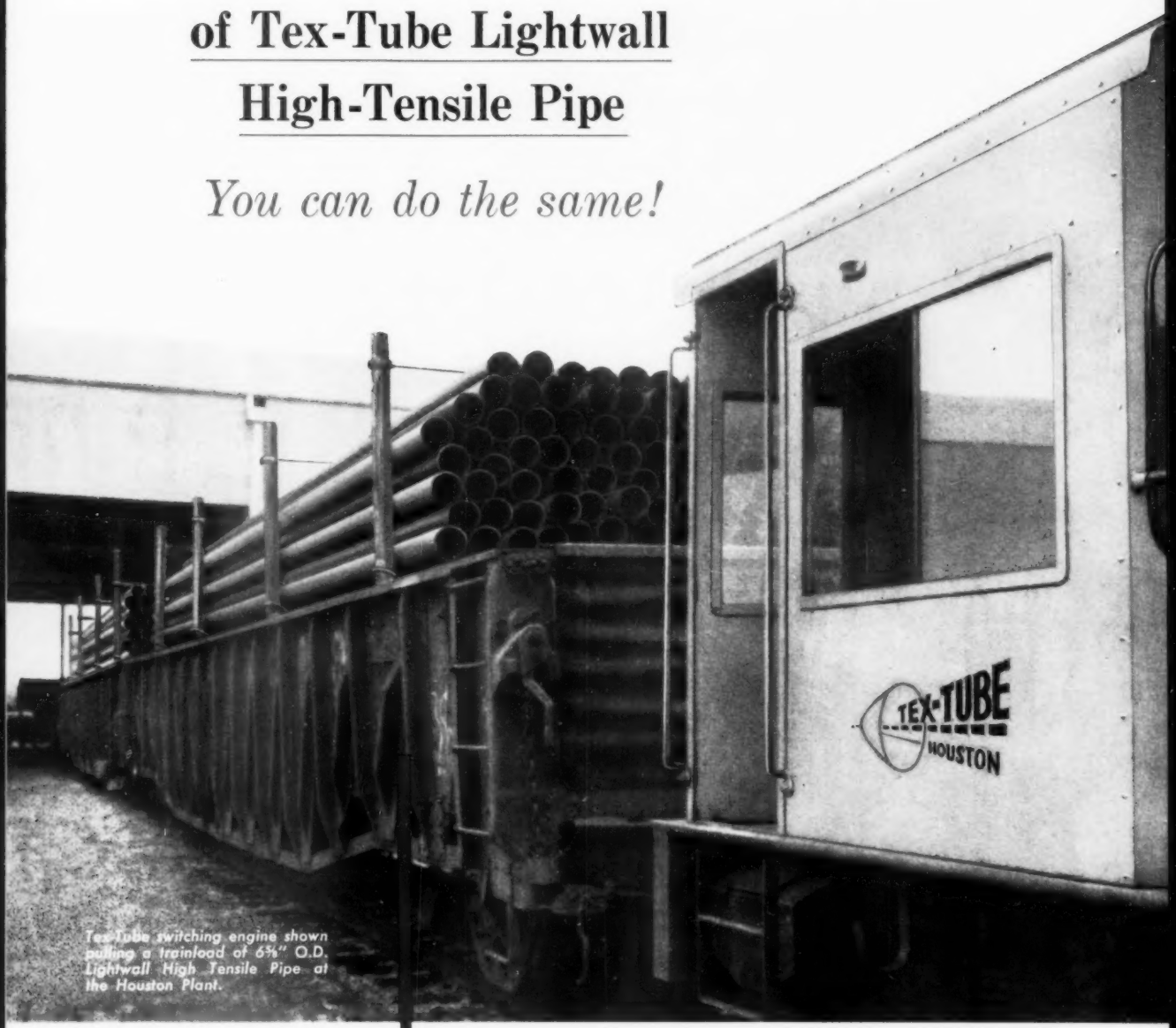
HILL·HUBBELL & COMPANY

DIVISION OF GENERAL PAINT CORP. • 3691 MAYFIELD ROAD, CLEVELAND 18, OHIO

FACTORY APPLICATORS OF COATINGS AND WRAPPINGS

Our Customer Saved $2407 per Mile of Pipe on this Trainload of Tex-Tube Lightwall High-Tensile Pipe

You can do the same!



Tex-Tube switching engine shown pulling a trainload of 6⅝" O.D. Lightwall High Tensile Pipe at the Houston Plant.

TEX - TUBE, INC.

1503 NORTH POST OAK ROAD • HOUSTON, TEXAS

Sales Offices in Midland, Texas - Tulsa, Oklahoma
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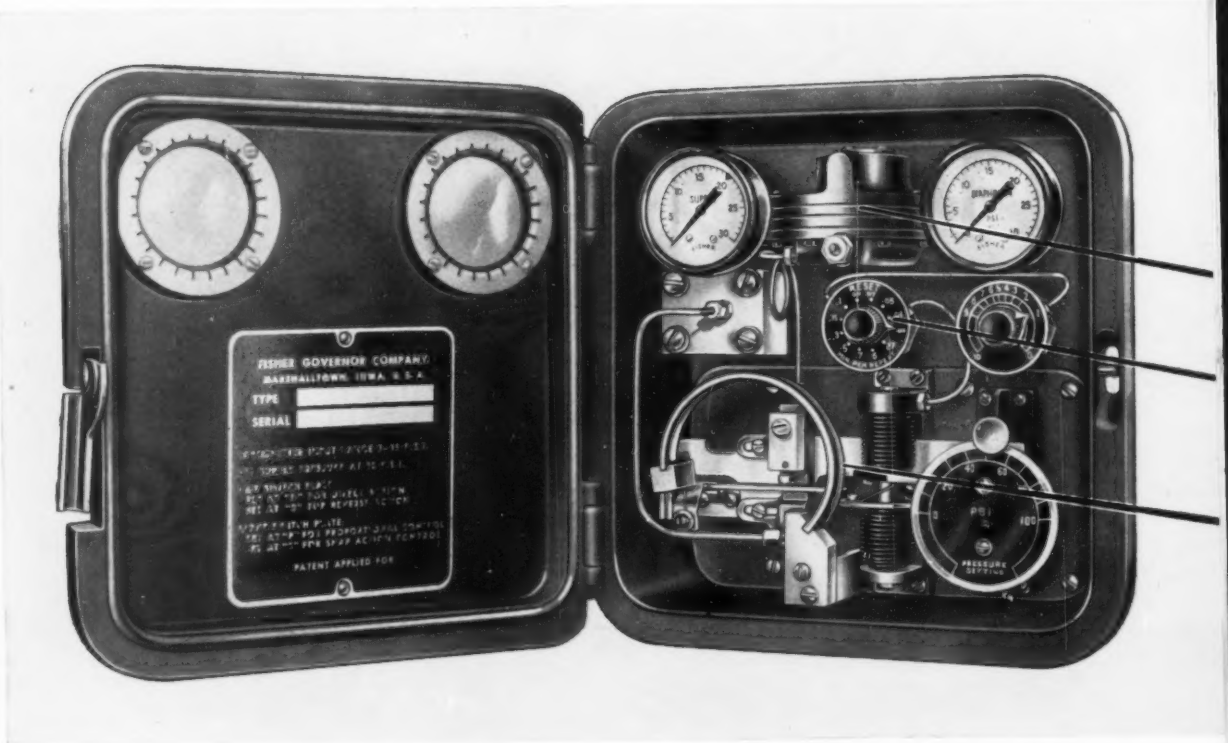
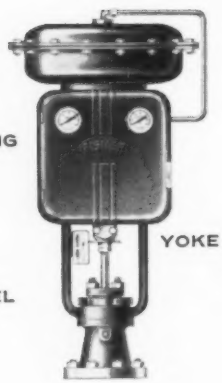
LICENSED BY THE AMERICAN PETROLEUM INSTITUTE

Now...Pin Point Control...



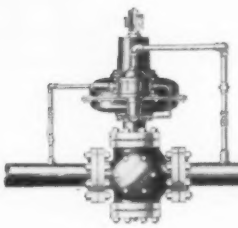
SURFACE MOUNTING

FLUSH PANEL MOUNTING



YOKE MOUNTING

PERFORMANCE DATA	
Test	**Results**
Air or Gas Consumption with 15 psi Output Pressure	Minimum at 10 or 0 Proportional Dial Setting—2 cfh Maximum at 5 Proportional Dial Setting—23 cfh
Resolution Sensitivity	Minimum Change Required in Measured Variable to Produce an Effective Movement of Final Control Element is 0.1% of Bourdon Tube Rating.
Repeatability	Ability of Wizard to Reproduce Its Output Signal for a Given Pressure Setting is 0.5% of Bourdon Tube Rating
Resonant Frequency	Unaffected at Usual Motor and Turbine Speeds.
Temperature Effects	Under Cold Box Test at —20° and Simulated Sun Test from 80° to 212°F Control Pressure Remained Within ±1% of Bourdon Tube Rating.



IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD...

FISHER GOVERNOR COMPANY

for Town Border Stations

the **WIZARD II**
PRESSURE CONTROLLER
with New and Improved Features

1. **VOLUME RELAY** for faster response to pressure changes.
2. **RESET FEATURE** for greater stability and pin point control, assuring perfect metering, even on multi-stage meter runs.
3. **WIDE RANGE** brass, steel or stainless steel Bourdon tubes cover a range of from 25 to 10,000 psi. Bellows assemblies for low pressure regulation in ranges from 0 to 25 psi.

Again FISHER engineering produces features the industry needs to do a better job

The Wizard II has been designed to specifically meet the demands of modern, complex systems requiring closer control. The Wizard II retains all of the basic simplicity, accuracy and dependability of the Wizard 4100U, plus its own exclusive features.

The new design consists of two sub-assemblies encased in a weather proof die cast aluminum housing which is provided with a ¼" pipe threaded vent for gas service. Either assembly can be removed without disturbing line connections.

The upper assembly consists of two gauges, relay and proportional band adjustment. The lower assembly includes the set point adjustment, proportional bellows, Bourdon tube and nozzle. Each assembly is assembled and calibrated before mounting in the case. The case can be mounted on a flush panel, a wall or on the yoke of the control valve.

Careful and exhaustive tests have conclusively proved that the Wizard II measures up to rigid Fisher standards.

A completely descriptive and illustrated bulletin on the Wizard II is yours for the asking. Write for Bulletin No. D-4150.

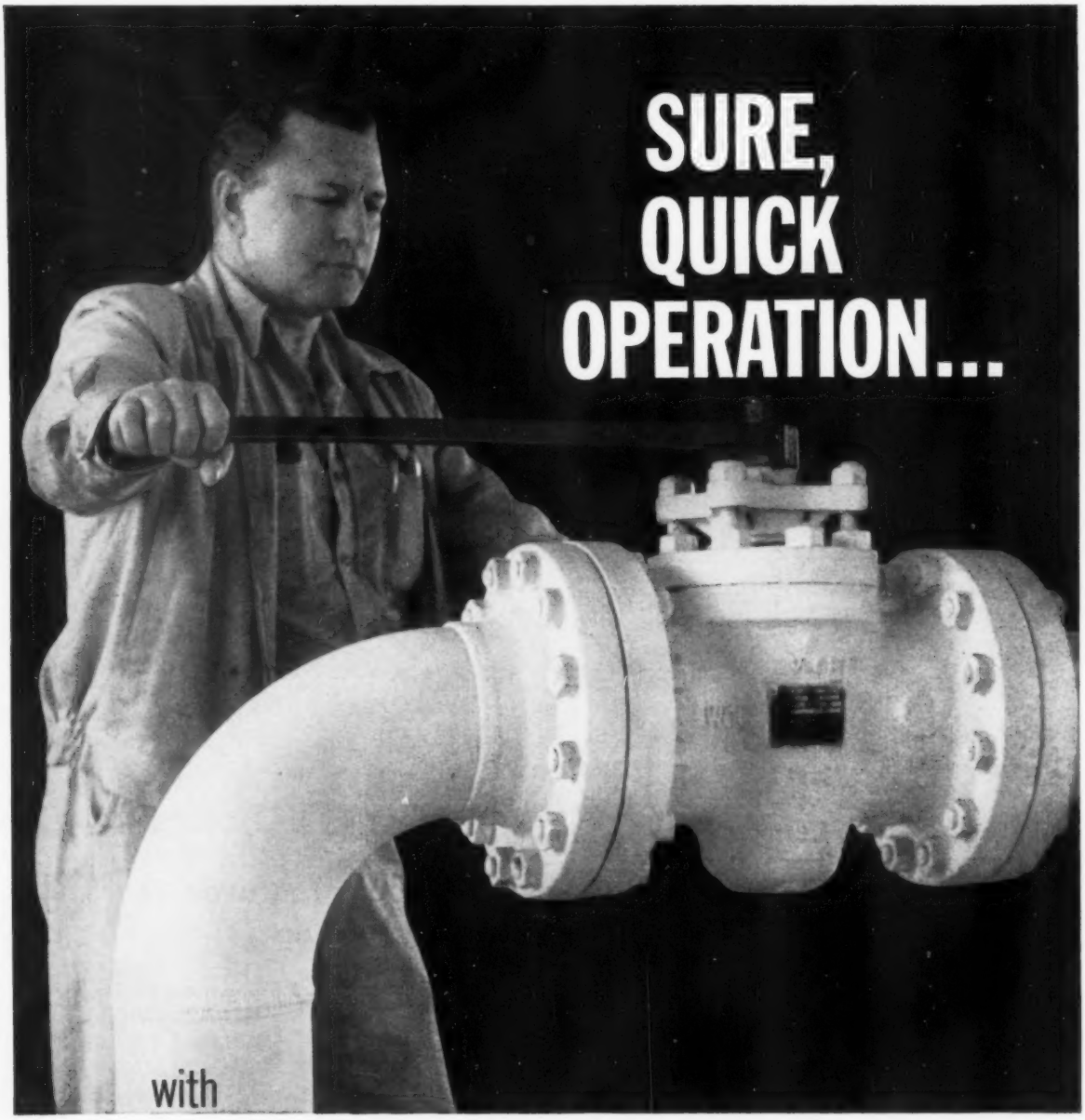
The original Wizard I is still available for those applications not requiring volume relay and reset features.

CHANCES ARE IT'S CONTROLLED BY...

FISHER® Controls

SINCE 1880

Marshalltown, Iowa / Woodstock, Ontario



WALWORTH LUBRICATED PLUG VALVES

Where closures must be 100% tight, where operation must be quick, where minimum maintenance is a must, Walworth Lubricated Plug Valves should be your first choice. Tight: because the lubricant seals the valve against leakage. Quick operation: a quarter turn of the plug opens or closes the valve. Fast: easy lubrication either with Walworth's high-pressure Lubricating Gun, or by manually inserting stick lubricant; the valve is easily serviced, even under pressure. Downtime is avoided. For complete information see your Walworth Distributor or write Walworth direct.

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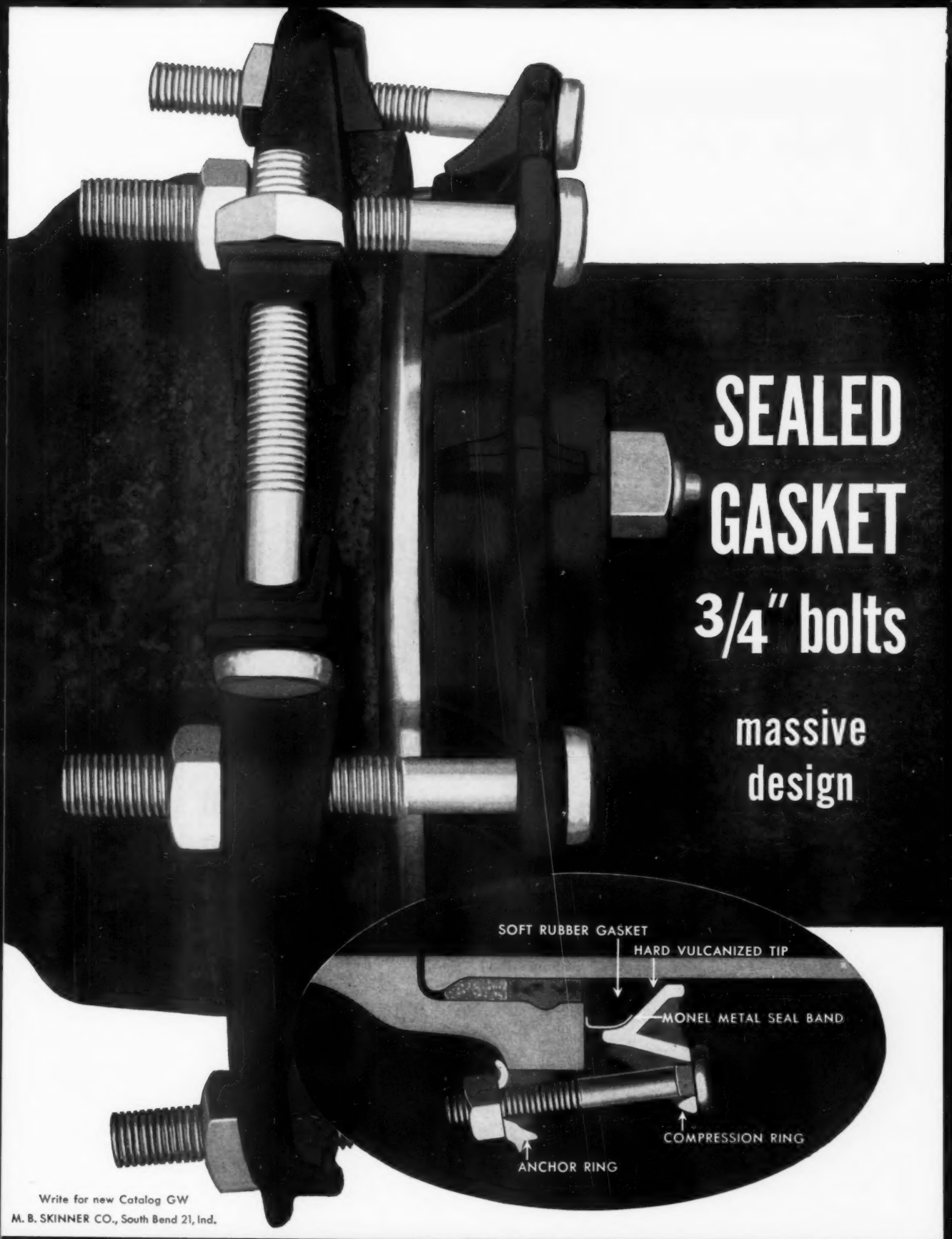
WALWORTH SUBSIDIARIES: ALLOY STEEL PRODUCTS CO. • CONOFLOW CORPORATION • GROVE VALVE AND REGULATOR CO. M&H VALVE & FITTINGS CO. • SOUTHWEST FABRICATING & WELDING CO., INC. • WALWORTH COMPANY OF CANADA, LTD.



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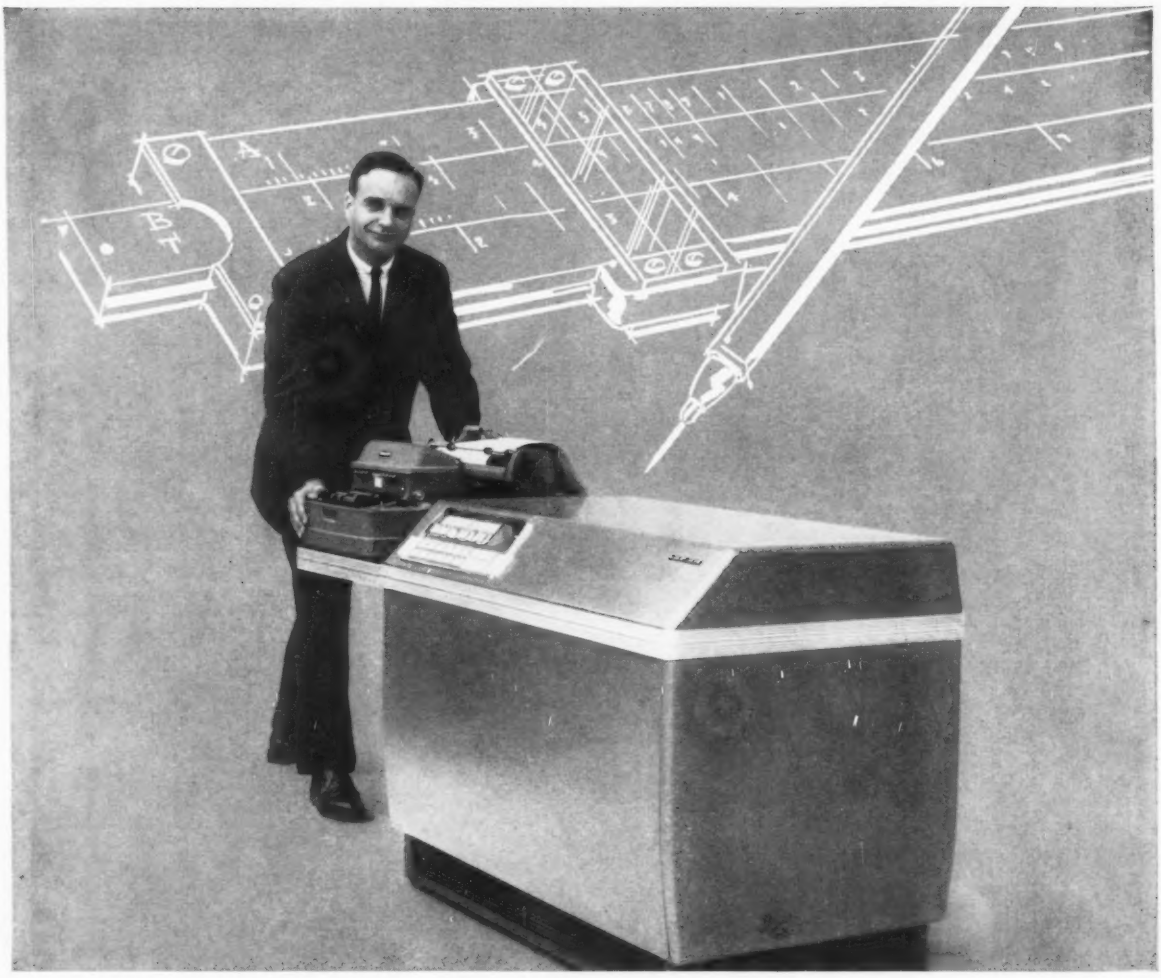


Now! On-site linear programming at high speed with this powerful electronic computer

ROYAL PRECISION LGP-30

Here's the mobile, stored-program electronic computer with large capacity...direct print-out of answers

Compact, completely mobile . . . Royal Precision LGP-30 will today furnish you with high-speed electronic computation *wherever you want it* – give you more time for *creative* engineering. And at the lowest cost ever for a complete computer system!

Unusual capacity. Operating from any convenient wall outlet, the self-cooled LGP-30 allows you to work your linear programming *on site*. Used *right at your desk* for any other problem, LGP-30 gives you the greater flexibility of stored-program operation...speed, memory (4096 words) and capacity comparable to equipment many times its size and cost. (In one application, for instance, LGP-30 handled a linear program with as large a matrix as 46 x 27.) Answers are printed out directly in a format which requires no deciphering.

Simple to operate and program. LGP-30's controls are so simplified, even non-technical personnel are quickly trained. Programming is easily learned. A library of sub-routines, plus programs for a wide variety of applications, are available.

Wide scope of gas industry applications. Among the many jobs for which LGP-30 is today being widely used in the gas industry are: distribution network analysis by Hardy Cross method, load forecasts, pipeline problems, analysis of gas field production, pumping scheduling, pipe stress analysis. LGP-30 can also supply information for better management controls.

Exceptional value; complete service. Smallest initial investment ever for a complete computer is combined with low operating and maintenance costs. Service facilities are available coast-to-coast.

For further information and specifications, write Royal McBee Corporation, Data Processing Equipment Division, Port Chester, N. Y.

ROYAL McBEE

data processing division

MUELLER®

500 pound

LubOseal®

stop — Ductile Iron for working pressures to 500 p.s.i.!

Form No. G-8913

Printed in U.S.A.

Ground key surfaces and Quad-Rings

Provide Pressure Seal . . .

GROUND AND LAPPED BODY AND KEY

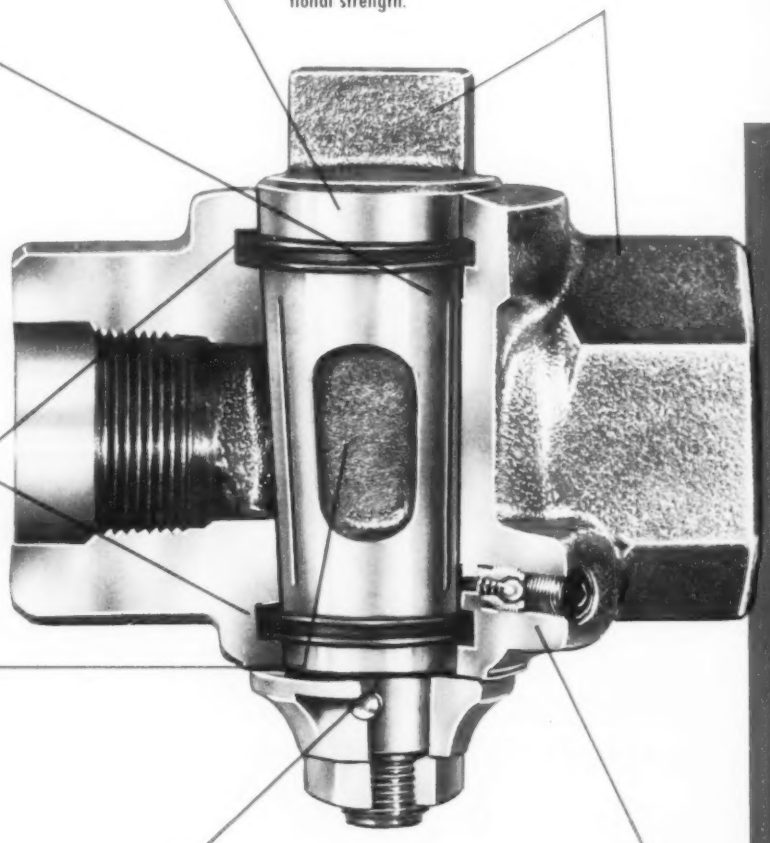
Ductile iron provides excellent machining qualities, therefore the body and key can be accurately machined and individually ground and lapped for a precision, gas-tight fit.

DUCTILE IRON BODY AND KEY

The corrosion resistance of cast iron with the strength, impact and fatigue resistance of steel—all these advantages are incorporated in the 500 pound LubOseal Ductile Iron Stop. The body threads are recessed for added strength and rigidity. The body ports are tapered to meet the straightway in the key, providing smooth flow and additional strength.

LUBRICATED KEY FOR EASY TURNING

The lubrication system of LubOseal Stops maintains a proper grease film on the seating surfaces, assuring easy turning and pressure tightness. It is not primarily intended to provide a gas seal by grease in grooves under pressure. Four vertical grooves in the key distribute the lubricant over the ground and lapped surfaces each time the stop is operated. The quad-rings in the circular grooves and the entire seating surface between these grooves are fully lubricated. In any position other than fully "opened" or fully "closed", the vertical grooves are disconnected from the circular reservoir grooves, preventing the line pressure from forcing the grease out of the greasing system.



QUAD-RING SEALS

The top and bottom of the key are positively sealed by quad-rings located in grooves in the body. The quad-rings also pressurize the lubricant—deflecting as the lubricant reservoir is filled and expanding to keep pressure on the lubricant as it is used.

FALSE PORTS

False ports in the key and body line up with the true body and key ports respectively when in the closed position. This prevents grit or dust from adhering to the seating surfaces of the key and later damaging them. The seating contact is reduced to only those areas where it is useful, resulting in an easier turning stop.

TAMPER-PROOF

A heavy bronze washer is secured to the lower end of the stem by a drive-lock pin in a blind hole, thereby permanently maintaining the perfect adjustment between the key and body. The stop is operable with the stem nut removed or with the nut over-tightened to the point of stripping the threads before the stem breaks, providing an additional safety feature.

TRIPLE-SEALED RE-LUBRICATING PORT

The grease port is located so that a ground and lapped seating surface is between it and the main gas port, preventing any leakage. A spring loaded, ball-check grease fitting provides a second seal. The socket head pipe plug forces grease through the grease fitting into the entire lubricating system and provides a final and permanent seal!

MUELLER CO.

DECATUR, ILL.

why use Ductile Iron?

Carbon exists in gray cast iron in the form of graphite flakes, (Figure 1). These flakes vary in size and length and at times intersect each other disrupting the continuity of the base metal. It is this arrangement of the graphite in the form of flakes that gives gray cast iron its brittle characteristics.

Ductile Iron (also called Nodular Iron or Spheroidal-Graphite Iron) is a type of cast iron in which the graphitic carbon is substantially in balls or in spheroidal form (Figure 2). The base metal is much more nearly continuous, therefore, the physical properties of Ductile Iron are more nearly that of steel or malleable iron.

The spherical graphite, which appears in the casting when poured, is formed by the action of small amounts of magnesium or cerium in the melt. Sound pressure-tight castings can be obtained even in the complex shapes and uneven sections of stop bodies.

The corrosion resistance of Ductile Iron is equal to, or better than, regular gray iron.

Both the body and key of Mueller 500 pound LubOseal Ductile Iron Stops are made in compliance with ASTM Specification A339-55; Grade 60-45-10.

MINIMUM PHYSICAL REQUIREMENTS

Tensile Strength	60,000 p.s.i.
Yield Strength	45,000 p.s.i.
Elongation in 2 in.	10 per cent

*Fig. 1. Gray Cast Iron. Failure could occur here.

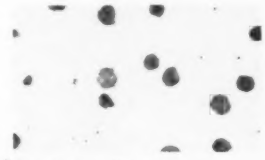
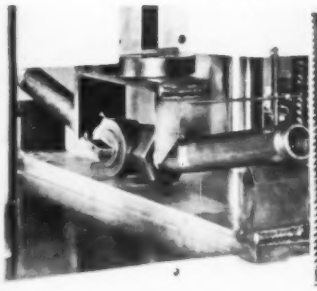


*Fig. 2. Ductile Iron.

*Fig. 3. Ductile Iron can be bent or twisted.

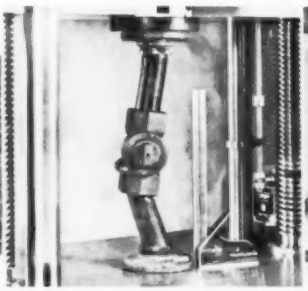
*Photos courtesy International Nickel Company

Rugged Tests Prove Durability!



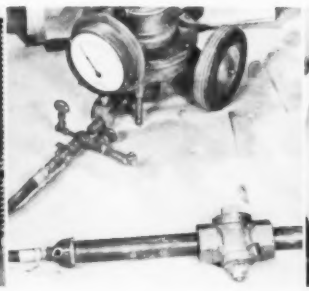
Bending Test—Stop with Schedule 80 Steel Pipe. Bending Load of 4,000 pounds applied. Bending moment of 18,000 inch pounds.

Results—Pipe was badly distorted. Stop position bent 2.83 inches out of line. Stop intact. Retested at 500 p.s.i. air pressure under water in closed position. No leaks at top or bottom of key or through the port.



Compression Test—Stop with Schedule 40 Steel Pipe. Compression load of 26,200 pounds.

Results—Pipe was badly distorted and threads on the pipe were stripped. Stop position was bent 1.30 inches out of line. Stop was then retested to 500 p.s.i. air pressure under water—absolutely tight in closed position with no leaks at either top or bottom of the key.

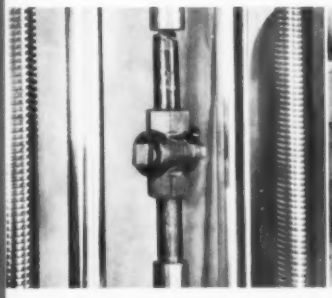


High Pressure Destruction Test—Stop in closed piping system. Tested under extreme pressure.

Results—Reducing coupling broke at 9,500 p.s.i. Stop did not leak at top or bottom of key under 9,500 p.s.i. Stop was then retested with 500 p.s.i. air pressure under water in the closed position with no leaks at either top or bottom of the key and with negligible port leakage. Stop shows high safety factor.

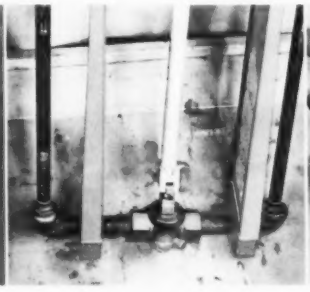
Torsion Test—Stop with Schedule 40 Pipe. The pipe on one side of the stop was securely fastened in a pipe vise. Torque was applied to the free end of pipe at opposite side of the stop.

Results — Excessive tightening caused piping to fail with no damage to stop. Stop was then retested with 500 p.s.i. air pressure under water. Absolutely tight in the closed position with no leaks at either top or bottom of the key.



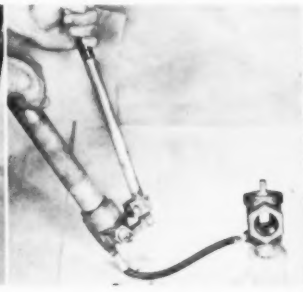
Tensile Test—Stop with Schedule 40 Steel Pipe. Tensile Pull of 22,150 pounds.

Results—Pipe stretched to breaking point in threaded section. Stop was then retested with 500 p.s.i. air pressure under water; absolutely tight in the closed position with no leaks at either top or bottom of the key.

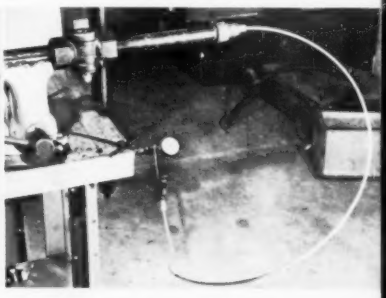


Cycling Test—Stop was fully opened and fully closed under air pressure of 350 p.s.i. with stop submerged in water for 6500 cycles without leakage at either top or bottom of the key.

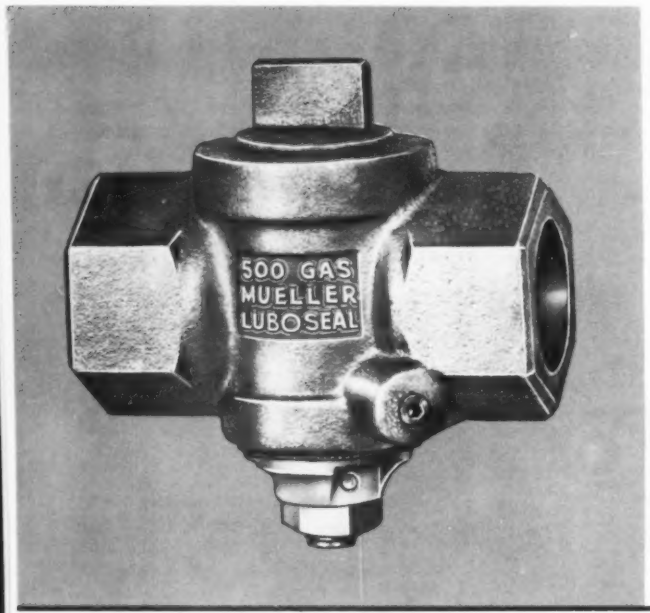
Results—After 6,500 cycles, stop was regreased and re-tested under water. There were no leaks at top or bottom of the key or through the port with the stop closed.



Regreasing Stop—Open Position—Stop was regreased in open position with excessive grease pressure applied. No grease entered the port.



Regreasing Stop in Line—Stop can be regreased in the line at rated pressure of 500 p.s.i. There is no loss of grease due to line pressure. (See Page 2.) Grease plug was removed under pressure. Results: No loss of grease through the relubrication port.



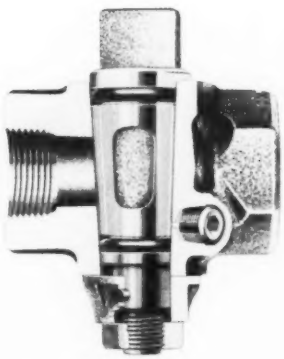
Standardize on LubOseal®

for high working pressures

H-11180 Solid Head
500 pound LubOseal Stop—
Ductile Iron
Sizes: ¾", 1", 1¼", 1½" and 2"
Inlet: Recessed Inside I.P. Thread
Outlet: Recessed Inside I.P. Thread
Finish: Black
Working pressure to 500 p.s.i.

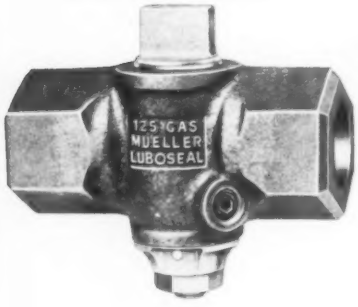
125 pound LubOseal

The Mueller 125 pound LubOseal Stop is iron body with bronze key. "O" rings at top and bottom of key provide a permanent seal against gas leakage to the atmosphere. The bronze key and iron body are ground and lapped to exacting tolerances to prevent leakage around the port. Key is re-lubricated through an independent port in the body—vertical grooves in key distribute lubricant over ground key surfaces each time stop is operated—lubricant is sealed in by "O" rings and ground key surfaces—offers absolute assurance of easy turning. Steel drive lock pin, driven in a blind hole through washer into key, makes stop tamperproof—not only holds key in body but also maintains key adjustment for proper and safe operation even if nut is accidentally removed by an unauthorized person.



H-11175 Lock Wing
125 pound LubOseal Stop
Sizes: ¾", 1", 1¼", 1½", 2", 2½"
Inlet: Inside I.P. Thread
Outlet: Inside I.P. Thread
Finish: Black or Galvanized
Working pressure to 125 p.s.i.

H-11170 Solid Head
125 pound LubOseal Stop
Sizes: ¾", 1", 1¼", 1½", 2", 2½"
Inlet: Inside I.P. Thread
Outlet: Inside I.P. Thread
Finish: Black or Galvanized
Working pressure to 125 p.s.i.



H-11173 Solid Head—Recessed Ends
125 pound LubOseal Stop
Sizes: ¾", 1", 1¼"
Inlet: Recessed Inside I.P. Thread
Outlet: Recessed Inside I.P. Thread
Finish: Black
Working Pressure to 125 p.s.i.

MUELLER CO. since 1857 SERVING the Water and Gas Industries QUALITY

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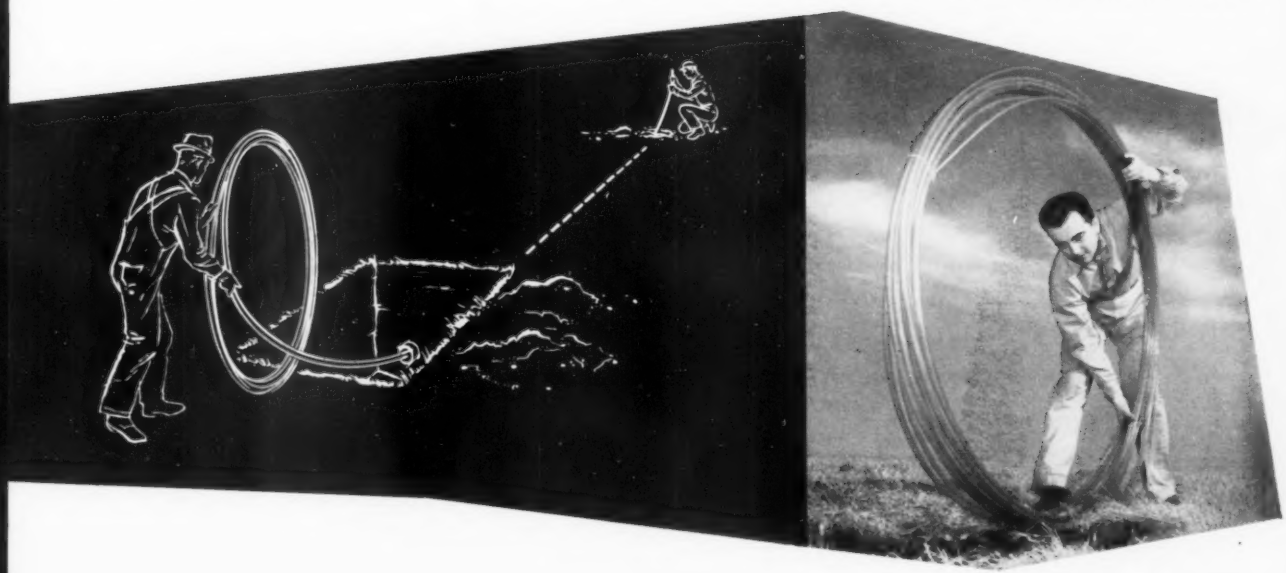
In Canada: Mueller, Limited, Sarnia, Ontario.

Modern method of service replacement

There's no trenching
with tubing of Tenite Butyrate

Plastic tubing of Tenite Butyrate is the fast, economical way to replace corroded metal services. Trenching is eliminated. You merely dig two holes: one at the gas main tap, the other at the service riser. Tubing of Tenite Butyrate is then run right through the old pipe. Since its smooth walls create less friction than metal tubing, pressure is unaffected by the resulting slight decrease in diameter.

Tubing made of Tenite Butyrate has other advantages too: It is amazingly light in weight; an average service of 70 feet weighs less than four pounds. Connections are made between tubing and metal pipe



with simple adaptors. What's more, the tubing is unaffected by corrosive or electrolytic action of soil—your assurance of many years of trouble-free service.

Over a decade of use has proved the many advantages of Butyrate over metal for natural gas service. Nearly three million feet of this plastic tubing have already been installed by one company alone. *Tenite Butyrate has also been used by several progressive utilities as a material for mains.* Find out more about this modern approach to natural gas distribution. For information about tubing made of Tenite Butyrate, its fittings and installation, plus the names of suppliers near you, write: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE
BUTYRATE
an Eastman plastic

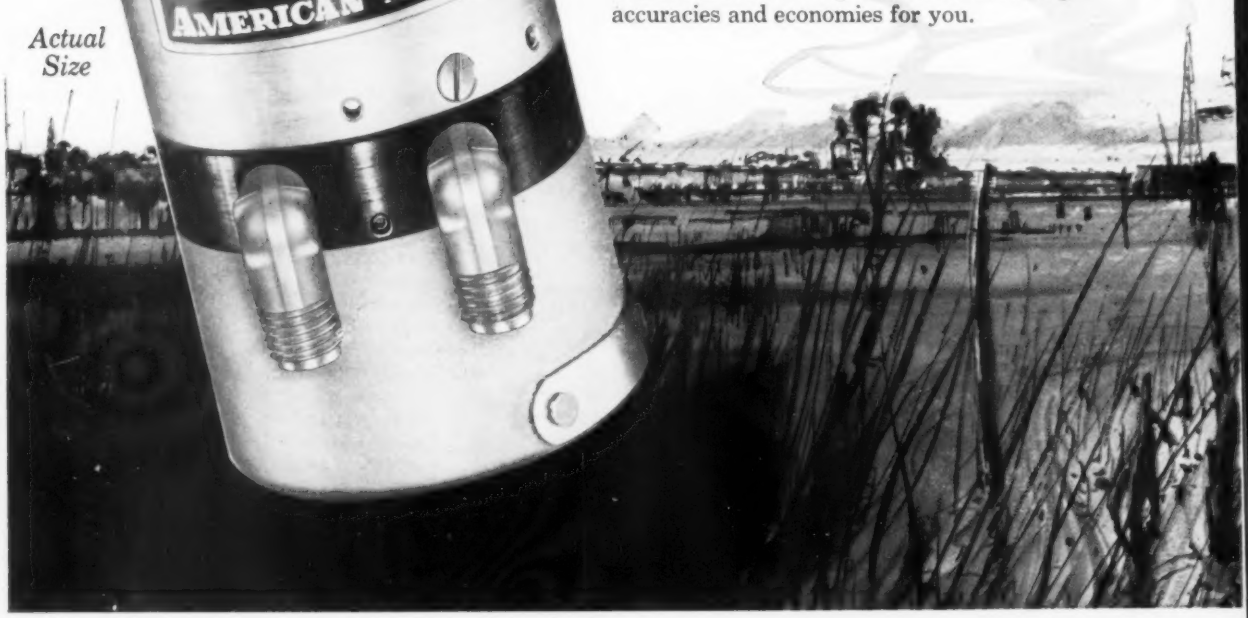
A 16mm. sound-color film, "Plastic Pipelines," is available upon request.

NEW American®
GASCLOK Power Drive
constant high power • uniquely accurate

Actual Size

American's new ***GASCLOK*** is a completely self-contained air or gas powered instrument drive and timing unit. Supplying a constant power output of over 20 times the torque delivered by conventional spring-wound clock mechanisms, it is ideally suited as either original or replacement equipment where continuous power and accurate timing are essential.

Perfect for all circular or strip chart records from one-hour to 30-day periods. Constant power and timing accuracy are assured since there is no "mainspring" to weaken or run down. Rugged durability and dependability are built into the ***GASCLOK*** Power Drive for years of service with minimum maintenance. It can provide new metering accuracies and economies for you.

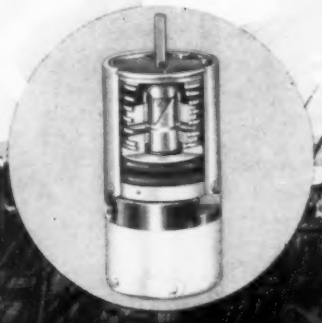


for instrument driving and timing
self-starting • air or gas operated

The versatile ***GASCLOK*** Power Drive is designed and field-tested for long trouble-free operation in remote location installations with all makes and types of recording instruments.

The high-torque, continuous drive provides power for: *Integrating Orifice Meters—Gas Lift Meters—Pressure Recorders Strip Chart Recorders—Telecounter Units—Field Program Timers* and many other instrument applications for accurate, automatic operation.

- **Self-starting mechanism completely self-contained—requires no winding or "priming" of power unit.**
- **Gas or air consumption only 5 cfh—normal operating pressure 5 psi—rotation 2 rpm.**
- **Timing escapement spring rewound every 5 seconds—eliminates fluctuating torque.**
- **Accuracy of timing unaffected by wide fluctuations in supply pressure.**
- **Timing mechanism internally sealed to prevent corrosion and clogging—all power unit parts exposed to gas are aluminum or stainless steel.**
- **Inherently explosion-proof.**
- **Large area internal ports to prevent plugging. All internal ports easily cleaned.**
- **Installation in any position—variety of mounting brackets available.**



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METER COMPANY
INCORPORATED (ESTABLISHED 1836)

AMERICAN METER CO EST. 1836 MEASUREMENT ENGINEERS ®

GENERAL SALES OFFICE: Philadelphia 16, Penna. • Albany • Alhambra • Atlanta • Baltimore Birmingham • Boston • Chicago • Dallas • Denver • Erie • Houston • Kansas City • Los Angeles Minneapolis • New York • Omaha • Pittsburgh • San Francisco • Seattle • Tulsa • Wynnewood
IN CANADA: Canadian Meter Company, Ltd., Milton, Ontario • Calgary • Edmonton • Regina
SUPPLIERS TO THE GAS INDUSTRY for Ironcase, Tinned Steelcase, Aluminumcase and Welded Steelcase Meters • American-Westcott Orifice Meters • Instruments • Reliance Regulators • Apparatus • Valves

Store natural gas safely—underground!

in USS National Seamless Steel Bottles

it's safe

Buried underground, National Seamless Steel Bottles are safe from harm. They are effectively protected from storms, high winds and lightning. And there is no hazard to or from aviation.

it's economical

Underground, Seamless Steel Bottles call for virtually no maintenance. They do not require periodical painting or constant inspection. And any group of bottles can be removed at any time without disturbing the other bottles.

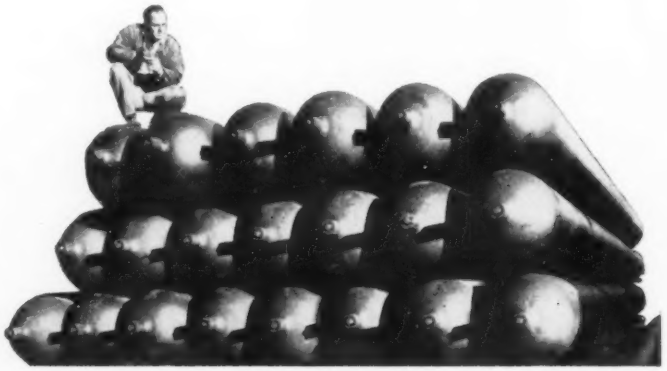
it's practical

Forty-seven of these bottles will hold 1¼-million cubic feet of gas at 2470 psi. They are pierced from solid billets of high-quality steel. Before being shipped, each one is subjected to a high-pressure hydrostatic test.

National Tube manufactures pressure vessels for innumerable services in various sizes and lengths. If you have a storage or pressure vessel problem, let us solve it for you. Write today to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pa.

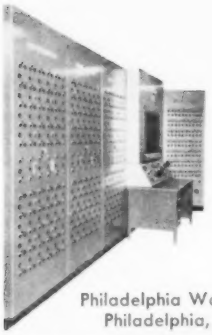
Walls Without Welds

All National Seamless Pipe and Tubes are pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.

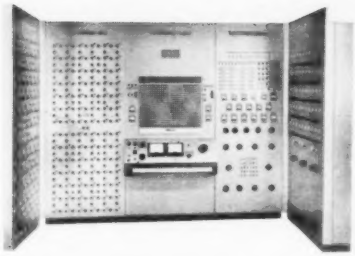


National Tube Division of USS United States Steel

Columbia-Geneva Steel Division, San Francisco, Pacific Coast Distributors • United States Steel Export Company, New York



Philadelphia Water Department
Philadelphia, Pennsylvania



Baltimore County Department of Public Works
Towson, Maryland

McILROY
FLUID NETWORK
ANALYZER

Used by leading utilities to provide up-to-the-minute system analysis and to prove, in advance, plans for expansion and growth.

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Washington Suburban Sanitary Commission
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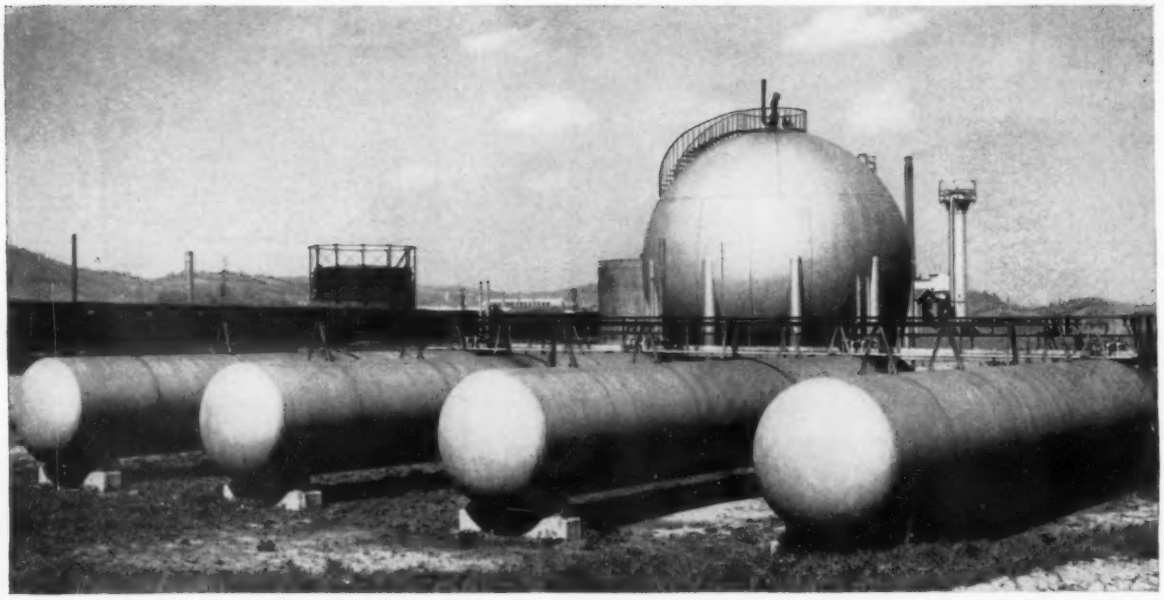
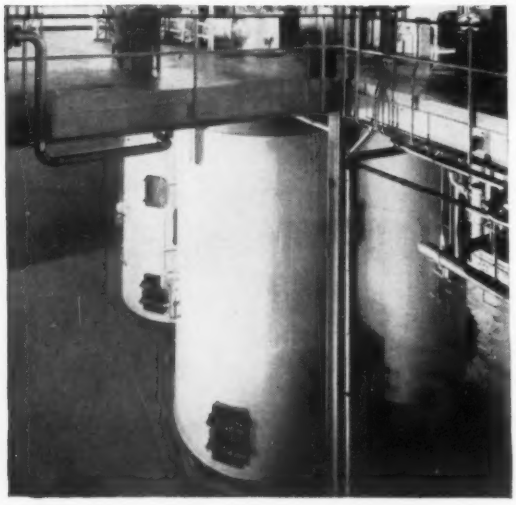
For information and a complete list of users of the McIlroy Fluid Network Analyzer, write to The Standard Electric Time Company, 89 Logan Street, Springfield 2, Massachusetts.

THE STANDARD ELECTRIC TIME COMPANY

Springfield, Massachusetts



Gas production facilities by United Engineers—to handle current and projected peak loads economically



If your planning shows a demand curve rising above your production capacity in the near future, the time to call in experienced counsel is right now. The long experience of United Engineers in designing and installing gas production equipment of many types and capacities can be of practical service to you.

After careful study of your equipment and your estimated gas production requirements, we may recommend modification of existing gas equipment or installation of new units. A reliable L.P. gas plant may well be the answer to your needs . . . a high Btu oil gas apparatus . . . or you may want the flexibility, high capacity, and economical operation of a U.G.I. Cyclic Catalytic Reforming (CCR) Unit.

The experience of 70 years' service in the gas industry is at your disposal in developing facilities to meet demand. And our many new assignments from clients previously served is your assurance of maximum return for each dollar expended.

UNITED ENGINEERS

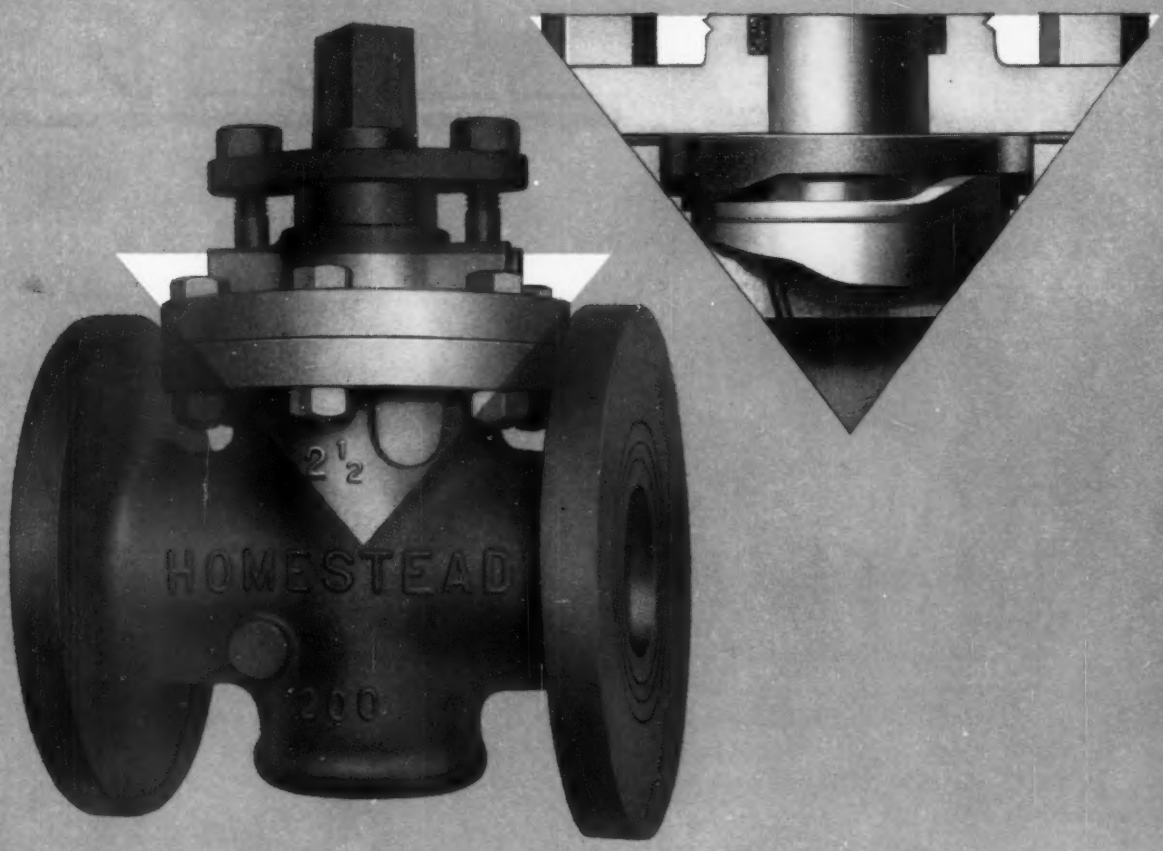
& Constructors Inc

U.E.&C. (Canada) Ltd.

New York • PHILADELPHIA • Chicago

In the spots that count... Homestead® Valves are

QUICK-ACTING



FASTER FLUID CONTROL is guaranteed by the quarter-turn action that fully opens or closes Homestead Cam-Seald Valves. A cam limits plug travel and automatically presses the matched seating surfaces of the plug and body together to form a leakproof, metal-to-metal seal. Additional design features such as the sealed bottom, seal between cap and body, the deep stuffing box, and the fact that fluid or grit cannot pass across the seating surface in the open or closed position, assure long, leak-free service. Write today for complete information—see how Homestead fills your needs.

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HOMESTEAD VALVE MANUFACTURING COMPANY

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DATA PROCESSING SYSTEM

• **First of IBM's line of fully transistorized data processing systems is the new IBM 7070—the most powerful and completely balanced system in the medium-scale computer field. It combines, for the first time in a solid-state system, higher storage capacity, faster computing speeds, new high-speed input-output units and a complete programming system.** ***In short, the IBM 7070 gives more performance per dollar than any system in its class.***

The SYSTEM: Transistor design lowers initial cost, minimizes cooling power and maintenance needs. "Building block" design grows as you grow. Other exciting features: IBM 7070 "reads," "writes," computes simultaneously; provides "automatic priority processing" for most economical use of system time. Ninety-nine built-in indexing words—more than in any other system—mean fewer operating instructions, faster, simpler programming. RAMAC® files provide immediate access to data.

The SERVICE: Unmatched IBM systems know-how is part of every IBM 7070 "package." From education of your personnel to top-notch service engineering, from program planning to testing—IBM men and methods stand by you to assure profitable operation as fast as possible. In addition, with the IBM 7070 you will receive a library of advanced programs at no extra cost!

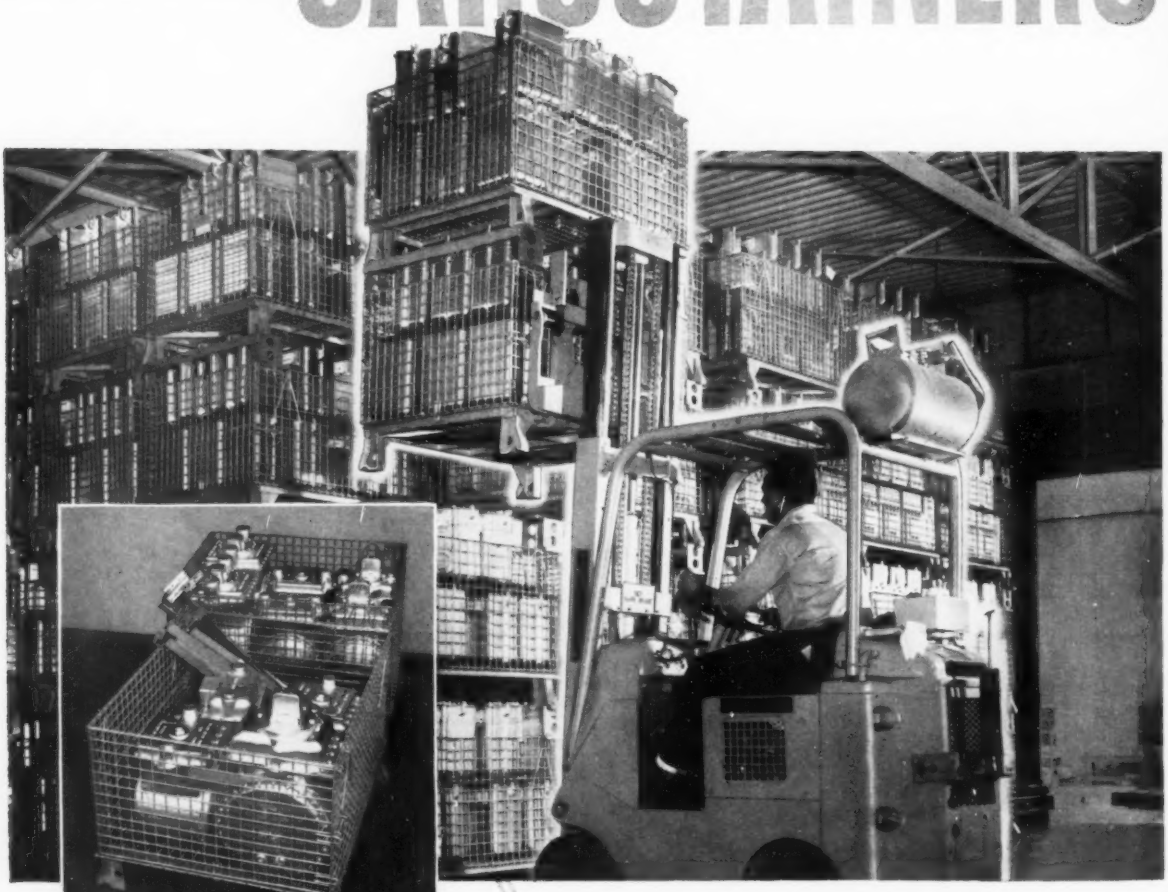
The SAVINGS: Major design breakthroughs make possible lower lease or purchase prices, lower operating costs. For example, the IBM 7070 will sort at least 30% more economically than other computers. And equally important are the savings you make through added efficiency and more complete management information with the IBM 7070.

For further information, call your local IBM representative. Ask for free booklet, "IBM 7070." Or write: International Business Machines Corporation, 590 Madison Avenue, New York 22, N. Y.

IBM ® **DATA PROCESSING**

HOW A LARGE SOUTHWESTERN UTILITY

REDUCED MATERIAL HANDLING COSTS WITH . . . CARGOTAINERS



* *from manufacturers*
-to storage
-to field warehouses

This utility company had over half a million meters in service and required 40,000 new installations annually. The cost of individual handling of meters, regulators and other equipment was high. Inventory control was expensive.

About two years ago they began the experimental use of CARGOTAINERS and have since standardized on them because: 1) Meters and other equipment are shipped in them direct from manufacturers. 2) These containers are unloaded by fork-lift truck in minutes and stacked four-high in storage. 3) They provide visible inventory. 4) Needs of eight divisional bases are met without removal of contents. 5) Collapsed when not in use, they are conveniently stacked.

CARGOTAINERS are available in sizes to suit *your* material handling needs. Write today for complete information and prices.

CARGOTAINER
DIVISION
TRI-STATE ENGINEERING COMPANY
WASHINGTON, PENNSYLVANIA

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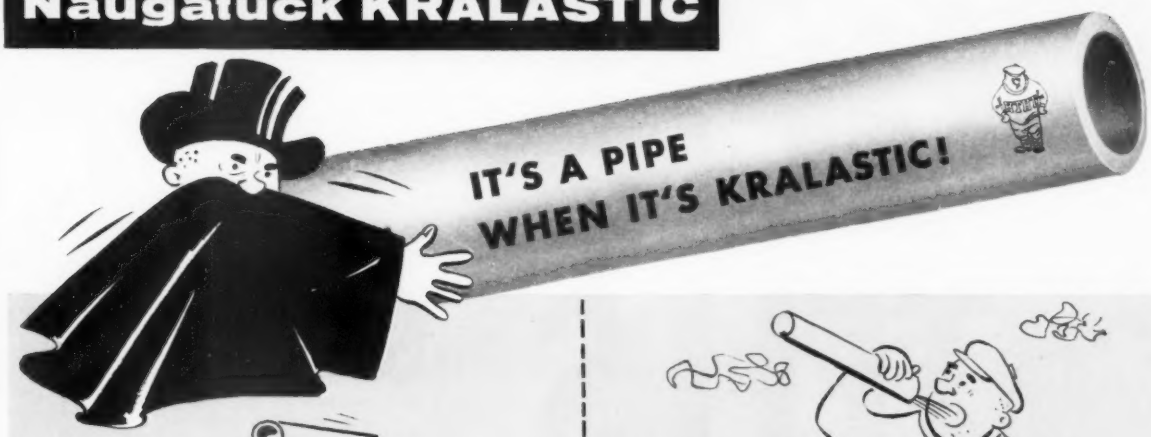
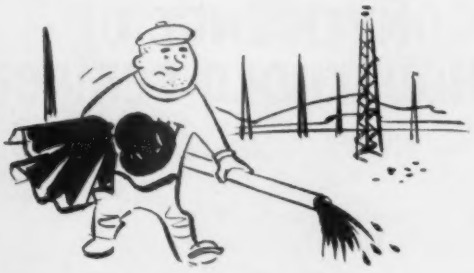
Naugatuck KRALASTIC

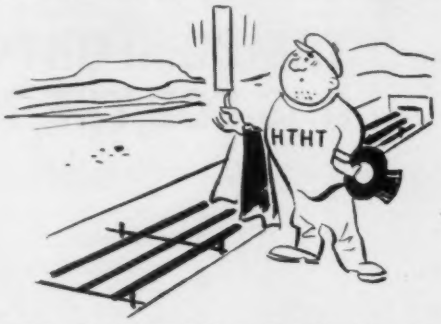


Natural gas lines can't rot or rust when made of corrosion-proof Kralastic® Pipe. It's completely free from electrolytic action—never needs coating, lining, or anode protection.

You can easily and economically lower your irrigation costs with Kralastic Pipe. Tough and hard, it is not affected by weather and is impervious to water and soil chemicals.



Kralastic is a big hit in the oil fields. It resists scaling and most chemicals—is impervious to water and soil elements. The extremely smooth internal walls minimize back pressure.



The light weight of Kralastic makes it ideal for electrical conduit—it can carry the same number of lines, with much less poundage.

Kralastic HTHT is a new resin-rubber blend extruding and molding compound that provides higher tensile strength, higher temperature resistance in piping. Because of its proved durability, toughness, flexibility, chemical resistance, light weight and speed of installation, pipe made of Kralastic has achieved a unique position in the field of thermoplastic pipe.

Write us for more information about pipe manufacturers using Kralastic HTHT—or about your own production problems.

United States Rubber

Naugatuck Chemical Division 1026K Elm Street Naugatuck, Connecticut

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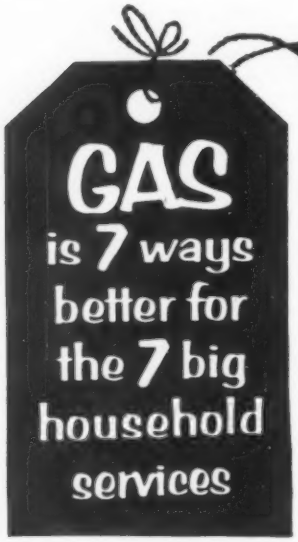
GEM TELLS MILLIONS OF READERS

SELLS MILLIONS OF HOME OWNERS

THE COMFORT AND CONVENIENCE OF GAS FOR THE 7 BIG HOUSEHOLD SERVICES

Suppliers to the Gas Industry Build a Brighter Future for Themselves *and for their Customers.*

These 13 Manufacturers supplying equipment to the Gas Industry sell more Gas to homeowners by investing in national advertising in The Saturday Evening Post, New Homes Guide and Home Modernizing.

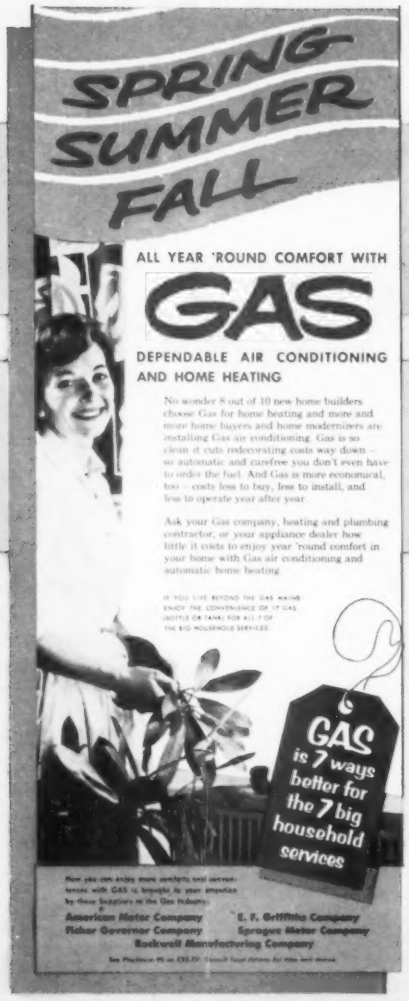


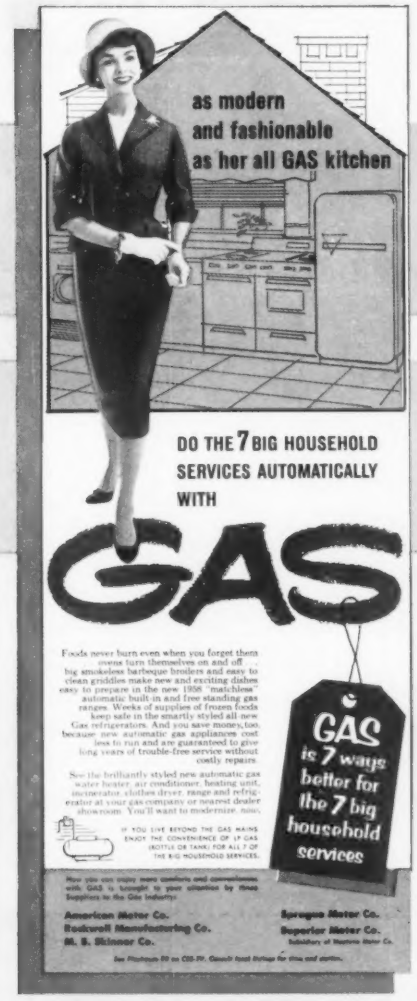
American Cast Iron Pipe Co.
American Meter Co.
Bastian-Blessing Co.
Cleveland Trencher Co.
Dresser Industries, Inc.
Fisher Governor Co.
E. F. Griffiths Co.
Rockwell Manufacturing Co.
M. B. Skinner Co.
Sprague Meter Co.
Superior Meter Co.
Subsidiary of Neptune Meter Co.
U. S. Pipe and Foundry Co.
Vulcan Rubber Products
Division of Reeves Brothers, Inc.

GEM appliance price tags, sold for only $10 per thousand, tell and sell on the display floor.

See Playhouse 90 on CBS-TV.

GEM National advertisements like these
SELL MORE GAS FOR YOU


SPRING
SUMMER
FALL
ALL YEAR 'ROUND COMFORT WITH
GAS
DEPENDABLE AIR CONDITIONING AND HOME HEATING
No wonder 8 out of 10 new home builders choose Gas for home heating and more and more home buyers and home modernizers are installing Gas air conditioning. Gas is so clean it cuts redecorating costs way down — so automatic and carefree you don't even have to order the fuel. And Gas is more economical, too — costs less to buy, less to install, and less to operate year after year.
Ask your Gas company, heating and plumbing contractor, or your appliance dealer how little it costs to enjoy year 'round comfort in your home with Gas air conditioning and automatic home heating.
GAS is 7 ways better for the 7 big household services
American Meter Company
E. F. Griffiths Company
Fisher Governor Company
Sprague Meter Company
Rockwell Manufacturing Company


as modern and fashionable as her all GAS kitchen
DO THE 7 BIG HOUSEHOLD SERVICES AUTOMATICALLY WITH
GAS
Foods never burn even when you forget them ... ovens turn themselves on and off ... big smokeless barbeque broilers and easy to clean griddles make new and exciting dishes easy to prepare in the new 1958 "matchless" automatic built-in and free standing gas ranges. Weeks of supplies of frozen foods keep safe in the smartly styled all-new Gas refrigerators. And you save money, too, because new automatic gas appliances cost less to run and are guaranteed to give long years of trouble-free service without costly repairs.
See the brilliantly styled new automatic gas water heater, air conditioner, heating unit, incinerator, clothes dryer, range and refrigerator at your gas company or nearest dealer showroom. You'll want to modernize, now.
IF YOU LIVE BEYOND THE GAS MAINS ENJOY THE CONVENIENCE OF LP GAS (BOTTLE OR TANK) FOR ALL 7 OF THE BIG HOUSEHOLD SERVICES.
GAS is 7 ways better for the 7 big household services
American Meter Co.
Rockwell Manufacturing Co.
M. B. Skinner Co.
Sprague Meter Co.
Superior Meter Co.

All suppliers are needed...

to participate in the GEM program for protecting present profits and insuring future Gas Industry growth. To do your share, ask any GEM sponsor or write Gas Equipment Manufacturers Group, c/o Gas Appliance Manufacturers Association, 60 East 42nd Street, New York 17, N. Y., for information about participation in Gas Industry progress.

Dividends for every gas utility

Gas utilities are making the GEM advertising program even more effective by using GEM promotional materials.

Free ad mats are available for publishing these advertisements in local newspapers.

Free reprints of these advertisements enhance direct mail campaigns.

Published as a Service to the Gas Industry

AMERICAN®
METER COMPANY
INCORPORATED (ESTABLISHED 1836)

THE ANSWER TO CONNECTION PROBLEMS

BRANCH CONNECTIONS

MADE UNDER PRESSURE

The best and most economical method of making lateral or branch connections is to use Smith All Mechanical Joint Tapping Sleeves and Valves or Stopper Pieces. This method ELIMINATES GAS SHUT OFF and the permanent, leak-proof installation is achieved speedily by employing these simple procedures: 1. Block Sleeve Outlet Half under pipe, position side flange gaskets, bolt Sleeve halves together. 2. Position end joint gaskets; install follower rings, bolts and nuts. 3. Rotate Sleeve outlet flange to desired position, tighten follower ring nuts. 4. Tighten side flange gasket compression screws. 5. Attach Tapping Valve. The installation is complete and ready for tapping. 5. (Alternate) Stopper Pieces may be used in place of Valves when connections are made to low pressure mains and permanent shut off Valves are not needed; however, the use of Tapping Valves is recommended. The cost of the connection is reduced by quicker installation, elimination of skilled labor and costly jointing material. Bulletin will be sent on request.

51

FIRE HYDRANTS · VALVES · SINCE 1896

THE A.P. SMITH MFG. CO.

EAST ORANGE, NEW JERSEY

These famous trademarks

represent the quality products of manufacturers that are helping the Gas Industry through the GEM program of national advertising.

All suppliers to the Gas Industry are invited and urged to join GEM to help GAS grow and prosper. Write GEM Committee, Room 2925, 60 E. 42nd St., New York 17, N. Y.

As the Gas Industry grows, so will grow the business of everyone selling to it.

The new Superior ALUMINUM CASE METERS

. . . the slow-motion meters you can rely on longer

This slow-motion, long-lived meter operates at only 7 revolutions per cubic foot to reduce wear and stay accurate longer. And its simple, horizontal seam construction gives fewer chances for leaks . . . makes maintenance quick and simple. Whether it's adjusting the tangent through the handy access in the top . . . removing the top to grind the valve seat . . . or lifting out the valve table with the entire inner movement to replace the diaphragm, simply loosening a few screws makes everything accessible.

Get full details. Send for bulletin 1150.

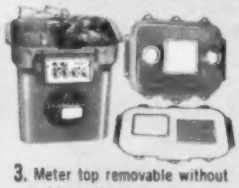
This modern meter exploits all the time-tested advances in meter technology *plus* the latest manufacturing techniques of Superior's new plant.

SUPERIOR METER COMPANY, INC.
19 West 50th Street, New York 20, N. Y.
A SUBSIDIARY OF NEPTUNE METER COMPANY

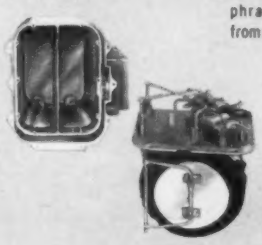
neptune

Look at these advanced design features:

1. Simple, horizontal seam . . . eliminates leakage . . . easier maintenance
2. Easily accessible table . . . just remove the screws holding top

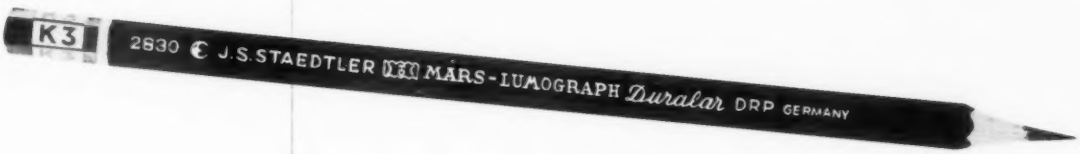


3. Meter top removable without taking off index box
4. Valve seat readily accessible for grinding when top is removed
5. Slow movement; only 7 revolutions per cubic foot
6. Seam gasket stays resilient . . . cork and Buna-N composition
7. Valve table lifts out with entire mechanism



8. Heavy-duty, sintered bronze bearings oil-impregnated for life
9. Flag arrangement gives arm smoother operation and longer life
10. Accurately controlled diaphragm . . . no inaccuracies from deflection
11. Cupped handling lids permit easy and safe carrying
12. Handy access for tangent adjustment and calibration
13. Broad base for solid stacking . . . designed for conveyorized handling
14. Index removable without removing meter

In 250 cfh and 340 cfh sizes to meet most domestic requirements.



WON'T SMEAR ON MYLAR®!

Duralar

The only pencil

that **can't smear** on Mylar, that **keeps a point** on Mylar, that **erases** on Mylar. Duralar drawings on Mylar **reproduce** perfectly, **microfilm** without loss and can even be **cleaned** with soap and water.

For a free sample

send coupon below with business letterhead. Specify whether you wish included a test sample of matte-surface Mylar tracing film. See for yourself how the sensational new Mars Duralar solves your drafting problems. And Duralar is available (pencils, leads and lead holders) in five special new degrees of hardness (K1 to K5).

Sold only at engineering and drawing material suppliers.

Another first from

MARS

J. S. STAEDTLER, INC. HACKENSACK, N. J.

Gentlemen: Please send me FREE

☐ The revolutionary new DURALAR pencil

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CITY _____ ZONE ___ STATE _____

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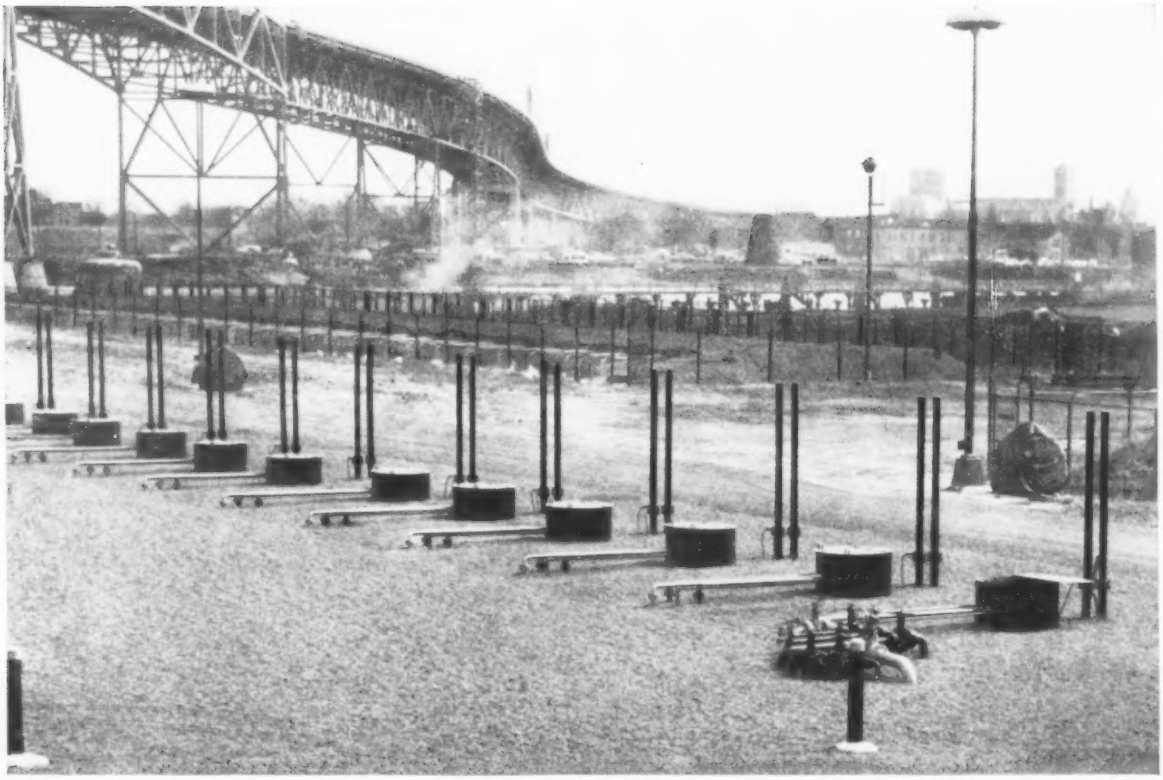
SHAVING PEAKS AT PEOPLES GAS
with Pritchard's LPG storage plants



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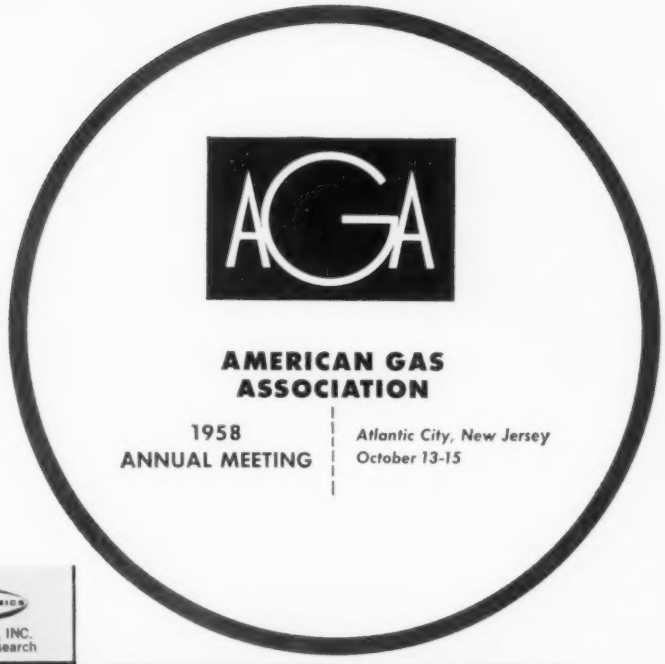

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GAS

OCTOBER 1958

Carnegie Natural Builds a BIG ONE

Big 43-in. and 55-in. OD lines are paralleled in one of the gas industry's most unique construction projects in years.

By WILLIAM W. CLARK
Eastern Editor

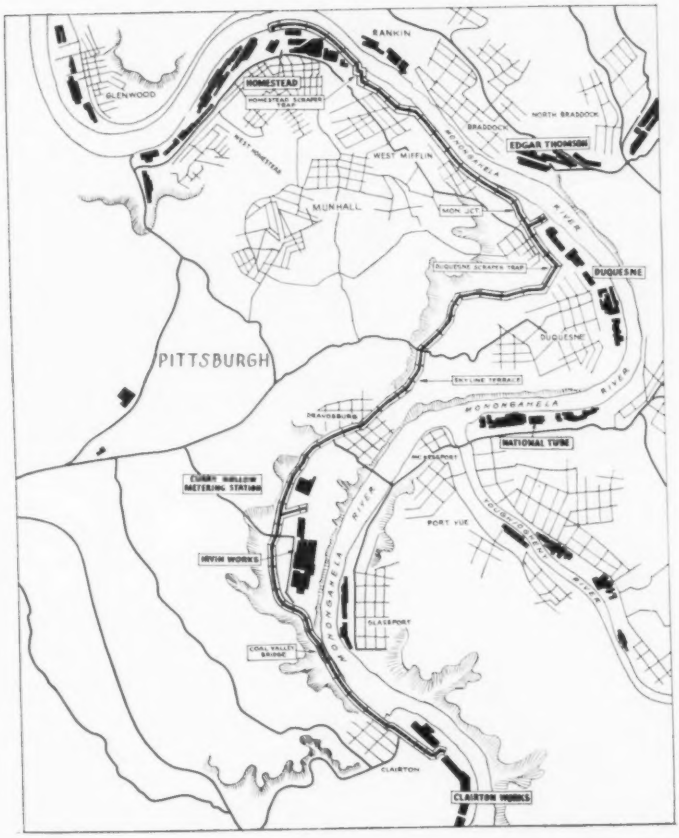


Fig. 1. Six major steel plants in the Pittsburgh area are served by the 13-mile, giant-diameter pipelines.

WHAT may be the nation's largest-diameter mixed-gas transmission project will go on stream at the end of the year to serve U. S. Steel's six giant mills in the Pittsburgh area.

This system (actually dual lines) has a tremendous job. It must move large volumes of low-pressure gas 13 miles without compression. One gas is a by-product of a coke oven operation. It contains large quantities of tars and condensates; consequently, frequent on-stream pigging is a must, yet the pipe is being laid in some of the hilliest country around hilly Pittsburgh. The other gas is natural gas, which must be

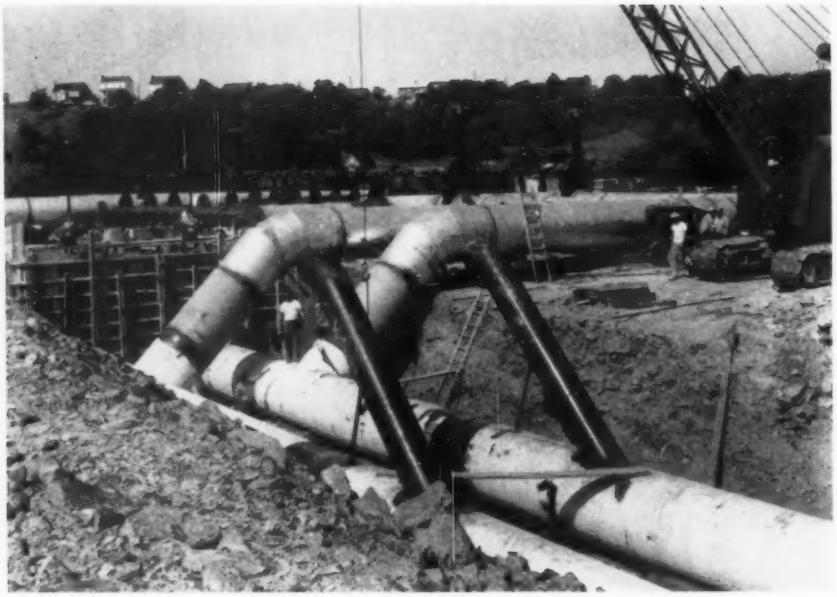


Fig. 2. Metering station at Curry Holly. The 55-in. connections bring coke oven gas from meter runs to mainline. Twin 24-in. lines (foreground) will inlet stabilized (natural gas-air) gas.

Fig. 3. Williams Bros. truck (no small rig) moves a fabricated section of 55.387-in. OD, 0.437-in. wall pipe to the right of way.

Fig. 4. This view aptly shows some of the construction problems encountered. Note different designs of supporting towers.

Fig. 5. The big steel lines go over a ravine and railroad tracks on this 535-ft (360 ft between towers) suspension bridge.

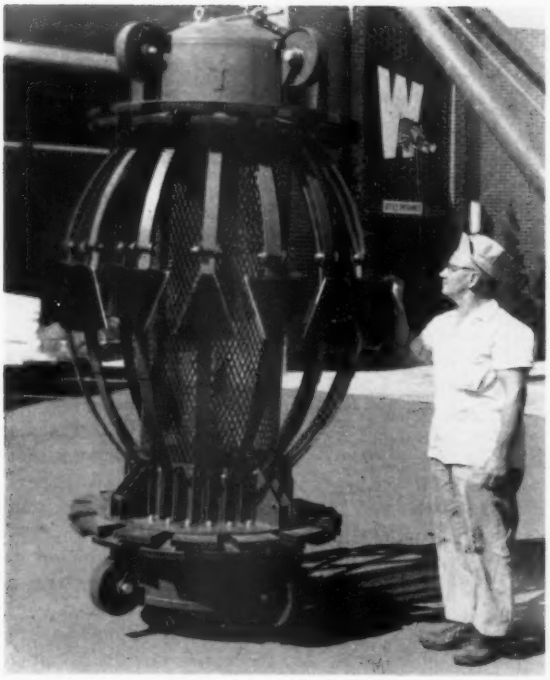
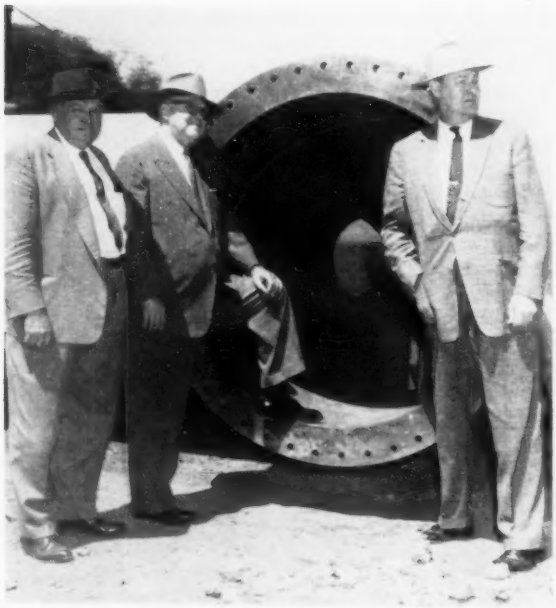


Fig. 6. This 121-in., 2200-lb, specially designed pig will scrape the 55-in. line. Springing of brushes will allow miter bends to be cleaned and permit the scraper to pass through pipe 6 in. out-of-round.

Three of the men behind the planning and construction of the tremendous line are (from left): A. M. Garber, general manager of Williams Brothers, the contracting firm; H. H. Pigott, Carnegie Natural president; and Thomas Lynch, general superintendent of the gas company.



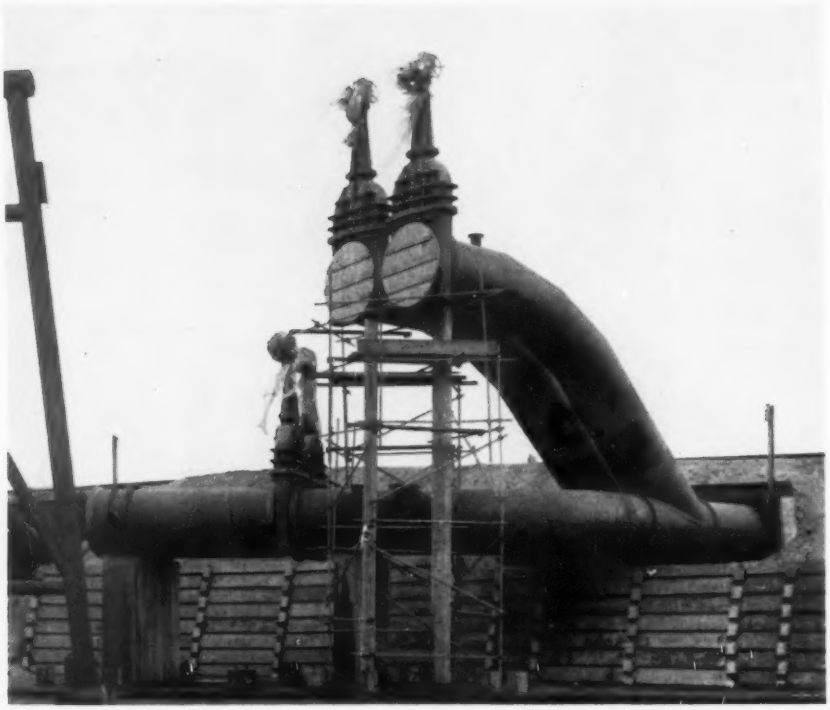


Fig. 7. Fifty-eight-inch OD pig launcher tube (lower, horizontal pipe) with 12-in. OD kicker (not installed here) will send scraper into the mainline. Angled risers are mainline take-offs to compressor station.

mixed with the coke oven gas in stabilized proportions that will assure uniform quality for under firing some of the largest steel furnaces in America.

The line is being designed and built by Williams Brothers (Tulsa), pipeline contractors, for Carnegie Natural Gas Co., a U. S. Steel subsidiary. Carnegie is a utility in the true sense of the word. It serves 3697 domestic customers from its natural gas system. But its biggest assignment is to transport fuel needed to keep the hearths in operation. It's not a new job for Carnegie, which has been supplying some of these mills for 68 years. But it's a more exacting job. The fuel delivered at the burner must be of nearly uniform quality if full advantage is taken of new automatic controls now available. This must be done despite ups and downs in steel production, affecting demand as well as supply of coke oven gas, which make for rather extreme fluctuations in the proportions of the make-up gases.

Carnegie Natural supplies six major plants—Clairton Works, Irvin Works, National Tube Division's McKeesport Works, Duquesne Works, Edgar Thompson Works at Braddock, and Homestead Works. These mills are strung out in that order along the 13-mile length of the new line. (See *Fig. 1.*)

Coke oven gas is obtained from the ovens at Clairton, located about 0.5 mile from the mill. Natural gas is brought in from the company's own fields, located in West Virginia and Pennsylvania, and from a tie-in with Texas Eastern Transmission Corp.

The plants used to be served by two lines; one a 40-in. line laid in 1919, the other a 48-in. built in 1926. These were operated from a mixing station at Curry Hollow, where natural gas was introduced into the system for its cross-country trip to the mills. Pressure at the inlet was 16 psig, which dropped to 3 psig at Homestead, at the tail end of the system.

These lines have inadequate capacity (for the new requirements) and are ready for retirement. New ovens are being added at Clairton coke works and existing batteries are being re-conditioned. The net effect of the increased supply is that 25 per cent additional capacity is required to carry the mixed gases.

Most of the old facilities are being replaced with modern equipment. The two new lines will be much larger, starting at 55.375-in. OD, and reducing to 43.25-in. OD at Duquesne, some 8.5 miles downstream. They will also be longer as they must follow a more circuitous route. The old right of way is now heavily built up, and could not handle the large equipment needed for the job. The new route follows a curve in the Monongahela river, where more industrial property is available.

New take-offs were also constructed to the metering stations at each mill. These vary in diameter from 24 to 36 in. depending upon demand. Three new metering stations will be constructed at Homestead and Irvin Works. Existing distribution lines will be retained.

The old mixing plant produced sendouts varying in calorific value from 581 Btu per cu ft upward (depending on the volume of natural gas injected), with related fluctuations in specific gravity. The new plant

will stabilize the mixture to a constant 800 Btu.

First, natural gas will be mixed with air in a battery of four jet compressors. These jets stair-step up in diameter; the first being 4-in., the second 6-in., the third 8-in., and the fourth 12-in. Each has double the capacity, the first 1.5 MMcf per hr, the second 3 MMcf, the third 6, and the fourth 12. This gives a total of 15 different possible rates up to a maximum of 22.5 MMcf per hr.

From the jets, the natural gas-air mixture is introduced into the by-product gas mixing system at the rate required to maintain a given pressure on the system according to demand (*Fig. 2*).

The straight natural gas as received has a heat content of 1074 Btu per cu ft, a specific gravity of 0.62. It must be stabilized to match the 581 Btu, 0.379 specific gravity of the coke oven gas to give an equivalent heat flow factor of 943. The resultant gas-air mixture will contain 25.4 per cent by volume of air.

The gas-air mixture in the jets will be controlled by a Calorimeter. Demand on the stabilization system will be met through use of Cutler-Hammer equipment. All pressures and flows will be telemetered into the new mixing plant with Bristol Metameters. The metering stations are equipped with 20-in. meters, with the runs, piping and equipment designed and installed in accordance with AGA Report No. 3. All pressures and flows will be telemetered to the mixing plant over 100-pair wire cable, which will also be used for voice communications. The valves at the mixing plant will be remotely controlled from the inside of the plant. At the other plants, the valves will be remotely controlled from a central panel board in each location.

Mainline pipe was fabricated by American Bridge Div., United States Steel Corp. to ASTM specification A283, Grade C, with 0.28 maximum carbon content (*Fig. 3*). Most is 0.437-in. wall thickness, and was hydrostatically tested to 100 psig. Design working pressure is 50 psig. Maximum pressure at the plant outlet will be 20 psig, which reduces to 5 psig at Homestead Works.

Pipe bends were prefabricated at the mill because of the many bends required and difficulty of field bending. Bends in all pipe above 30-in. were miter jointed. For 30-in. pipe and smaller, used in meter runs and meter run connections, directional transitions were made with Weldells. The entire line was prefabricated. Each piece of pipe was numbered and designated for a specific location in the line.

Because of the hilly terrain and slip areas, approximately 60 per cent of the mainline pipe was installed aboveground, supported by piers or steel towers. Hundreds of supports of varying design were used to meet specific conditions. In some cases, angle or chan-

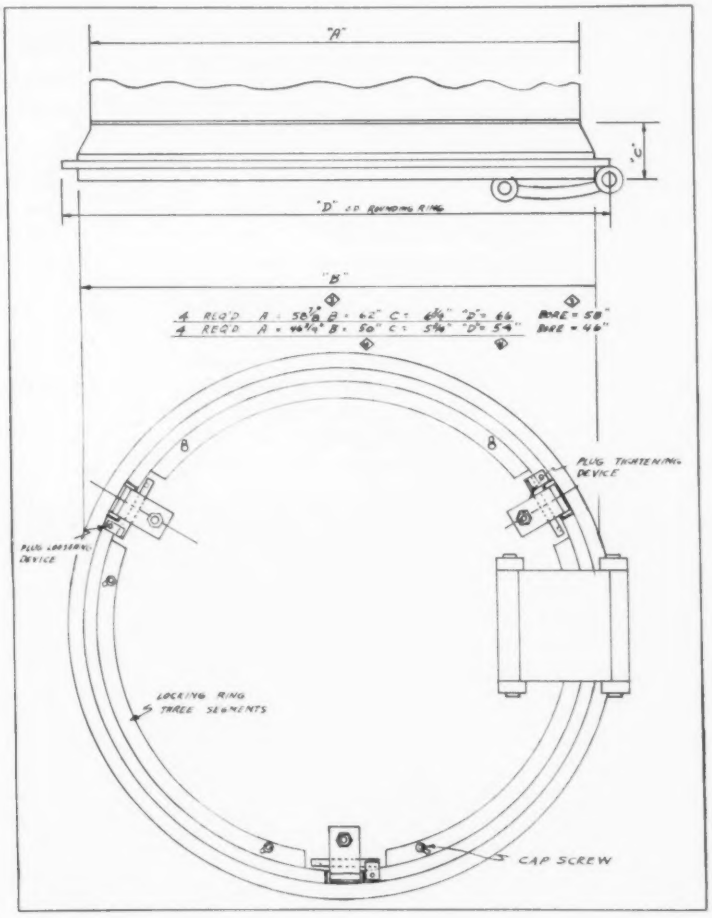
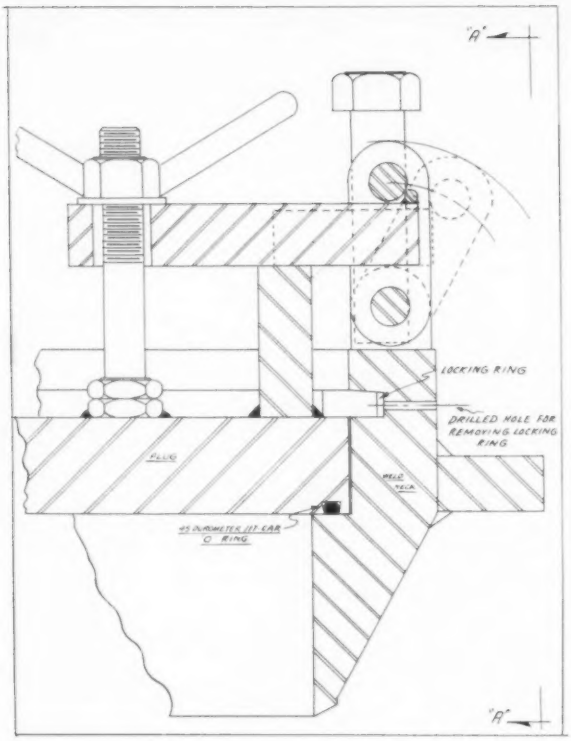


Fig. 8. Special 50-psig pig launcher closure design.



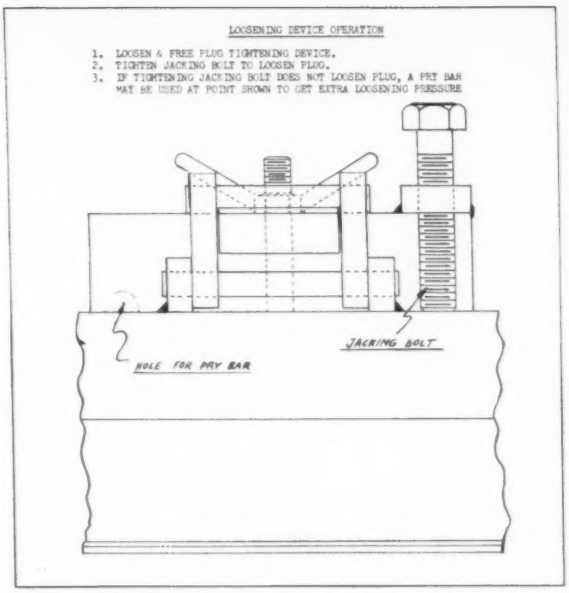

LOOSENING DEVICE OPERATION
1. LOOSEN & FREE PLUG TIGHTENING DEVICE.
2. TIGHTEN JACKING BOLT TO LOOSEN PLUG.
3. IF TIGHTENING JACKING BOLT DOES NOT LOOSEN PLUG, A PRY BAR MAY BE USED AT POINT SHOWN TO GET EXTRA LOOSENING PRESSURE
JACKING BOLT
HOLE FOR PRY BAR

Fig. 9a (left) and 9b. Tightening and loosening devices used on pig launcher closure.

nel iron was used for the structural members. But in the plants, where corrosion is more of a threat, steel pipe was used. Corrosive materials have no place to lodge on smooth pipe as they do in the bends and angles of other steel shapes. And pipe has no sharp corners where paint or coatings might be chipped off.

All joints installed overhead were field welded, as were those laid underground—where possible. Because of the difficult working conditions in the ditch in certain locations, some sections were joined with Dresser couplings.

At one point where the lines cross a railroad on a diagonal, three towers, each a different design, were used in a sequence to give sufficient clearance over trains. Two of these towers are cantilevered (*Fig. 4*).

One of the trickiest supports that had to be engineered was a suspension bridge with a span of 535 ft. The main suspension is 360-ft long. (See *Fig.* 5). End approaches have a total length of 175 ft. Support cables are of 2.50-in. prestressed spun steel. The bridge spans a railroad work yard in a ravine between two hills, which are steep and slippery. For a stable anchorage, the cables were deadmanned with 320 yd of concrete.

Towers and other supports were spaced 60 to 90 ft apart, except where 0.500-in. wall pipe was used. There the towers are 100 ft apart. The pipe was attached to permit contraction and expansion. At certain locations, it was anchored to the supports; at others, expansion joints were used. The anchor and expansion joints are used in proportion to each other. The placement of each was determined by gas temperature.

These types of supports kept the line on a close keel, enabling Williams Brothers, the engineers and constructors, to design it for frequent on-stream pigging. This was necessitated by the tremendous amounts of by-products that are introduced into the mixed gas stream by coke oven gas. It will take the largest pipeline pig to scrape out accumulated solids and liquids (*Fig. 6*).

The special scraper, 121 in. long and weighing 2200 lb, was manufactured by T. D. Williamson, Inc. (Tulsa). It is designed to travel on-stream (with the gas flow) through miter bends, gate valves and special dropouts, propelled by maximum gas pressure of approximately 1.50 psig.

A unique feature of this pig is its adaptability to pipe out-of-roundness up to 6 in. This is accomplished by a dependent spring-roller suspension system. At any point where out-of-round pipe is encountered the suspension system automatically relieves load on all rollers and allows pig to continue its run.

An old principle is awakened to a new use in the brush-spring assembly. Brushes are mounted on a lead spring. One end pivots as the other end is free to travel in a guided path, thus allowing large spring deflections enabling brushes to clean miter bends as pig traverses them.

Each line can be pigged from end to end in just two runs—one through the 55.375-in. pipe, terminating in a pig trap at Duquesne, the other from Duquesne on downstream through the 43.25-in. pipe. For the larger size, 58-in. straight-line launching barrels were constructed. For the kicker, to get the pig into the gas stream, 12-in. take-offs from the mainline were provided (*Fig. 7*).

The barrels are offset at a 50-degree angle, bending gradually to a connection with the mainline. The bend was limited to 15 degrees in any one miter, and miters are spaced a minimum of 1.5 pipe diameters apart. A similar design was used on the smaller line, where 46-in. OD barrels were built.

Special pig trap closures had to be built. These were designed and fabricated by Peerless Manufacturing Co. (Dallas). The closures consist (*Fig. 8*) of a weld-neck, which is welded to the pipeline and contains a seating surface for an O-ring. A blind flange plate with a dovetail O-ring groove is hinged to the weld-neck. A three-sectional wedge-type retainer ring is bolted to the blind flange so that each section can slide into the tapered groove in the weld-neck. These rings hold the blind flange in place against the hydrostatic end force.

It was necessary to design in tightening devices to compress the O-ring enough to get the retainer rings into position. Since it is expected that some tar-like substances will be deposited on the closure, it was also necessary to make provision for loosening the blind flange when the device is to be opened. The designs of the tightening and loosening devices are shown on *Fig. 9a and b.*

Scheduling pig runs will be determined after the line is in service. At present, it is anticipated that runs will be made approximately every two weeks; later, this plan will be modified on the basis of experience.

Scraper traps will pick up large amounts of tar and condensate. The long runs suggest that build-up ahead of pigs might be so heavy that it would stop them. To prevent this, a method of drawing off solids and heavy materials en route was provided.

Drips were the answer. These were designed and fabricated on the job by Williams Brothers. One design, designated Type 2, is made with a 72-in. barrel welded around the pipe to form a gas-tight jacket. The underside of the mainline, where it passes through this jacket, is perforated with 6-in. diam holes through which foreign substances in the gas can escape. (See *Fig. 10.*) An 8-in. drip line is welded to the jacket. This leads to an underground tank 48 in. in diameter and 20 ft long. The tank will be periodically pumped out.

A plunger is built into the drip line, which allows the line to be manually purged, preventing clogging.

For continuous draining of condensates and water, another drip, designated Type 1, was fabricated. This is an 8-in. line welded directly to the bottom of the mainline. It delivers into a buried tank, which is frequently siphoned.

A total of 72 drips were installed at low points in the line. Twenty-eight Type 2 drips were installed on a basis of 3000- to 4000-ft spacing. The remainder of the low spots were equipped with Type 1.

The lines were completely treated to mitigate corrosion. In the vicinity of the steel mills, corrosion is a problem of some proportions; and at Clairton Works, it is quite serious. There, the pipe is subjected to spray from the quenchers which has a high sulfur content. For protection, two coats of Bitumastic 300 were shop applied. All field joints were similarly coated. All other pipe located aboveground was given a shop coating of one coat of chromate primer and one coat of aluminum paint. A finish coat of aluminum paint was applied in the field.

All buried pipe was given a coat of coal tar primer, a coat of hot plasticized coal-tar enamel to a thickness of 3/32, a fiberglass wrap, a second coat of coal tar enamel of identical thickness, a wrapping of 15-lb asphalt saturated felt, and a final coat of whitewash. Joints were similarly protected after welding or coupling in the field.

Seven electrolysis test stations were spaced along the two lines. No. 10 copper wire leads were brought to the surface to a connection box on a 2-in. capped pipe.

Protection against corrosion was also a criterion in valve selection. All valves 36-in. diameter and above are of ductile iron, manufactured by Chapman Valve. A total of 243 valves are being installed in the system, including 16 in the 55-in. size. (See *Fig. 7.*)

When it is in operation, the system will have a total capacity of 250 MMcf per day. The supply of coke oven gas will continue to fluctuate, but the maximum output of the plant will be 188 MMcf. Regardless of the volume of gas available from this source at any given moment, the end product—the mixed gas— will be at a constant Btu value, thanks to Carnegie Natural's new multi-million dollar construction program. ■

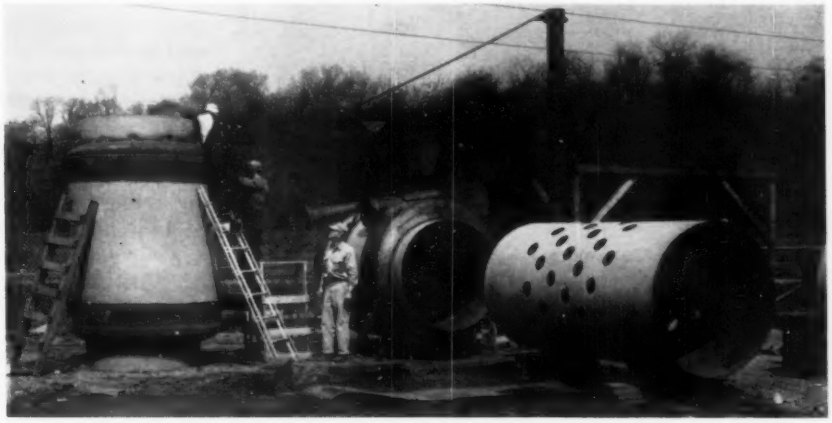


Fig. 10. Fabricated Type 2 drips. Note the perforated inner barrel and the two assembled drips.

FIG. 1. Incoming truck load of new meters packed in wire baskets is unloaded in matter of few minutes by one man operating fork lift truck at Southern Counties Gas Co. warehouse in East Los Angeles.

Wire baskets speed meter handling for Southern Counties

Fig. 2. New meters are stacked in tiers four baskets high by fork lift truck operator. Meters are unloaded from delivery truck and stacked in continuous operation.

SOUTHERN Counties Gas Co., which serves a widespread area throughout southern California, has solved a good share of its material handling problem through the use of wire baskets.

Some 18 months ago, SoCounties started storing and shipping meters and regulators in standard 40-in. x 48-in. wire baskets. The company ships in these wire containers meters, regulators, pipe fittings and other miscellaneous equipment such as hand tools from its main warehouse in East Los Angeles to its eight division operating headquarters.

Southern Counties' use of wire baskets evolved from an earlier practice of using metal containers for material handling. The all-metal containers proved to be too heavy for efficient handling, or for use in shipping. SoCounties then did some experimenting with wire baskets. These experiments showed that the wire containers would fill the bill.

Result: today the company has more than 600 of the wire containers in use throughout its system.

Biggest use of the wire containers is made for storing and shipping meters. Southern Counties now has more than 650,000 meters in service, and has been adding new customers at the rate of approximately 40,000 per year for the past five years. Also, after 10 years of service life, each meter must be removed and tested for accuracy. For the year 1958 some 45,000 such meters are being tested. This total, added to

Fig. 3. Regulators, too, are delivered and stored in wire baskets. Use of baskets cuts down drastically on handling time, and provides company with easy visual inventory at all times.

Fig. 4. Southern Counties ships all sizes of meters in baskets. Here, on meter shop dock awaiting loading, are two baskets of large commercial meters and one of small meters.

new meters, means that in 1958 approximately 90,000 meters are being shipped to divisions, and that a goodly number is being forwarded from divisions for shop processing. From these figures, it is easy to see that a lot of meters pass through the company's main warehouse in East Los Angeles each year.

Incoming new meters from American Meter Co.'s Fullerton (Calif.) plant are shipped in wire containers. It is a simple process for a fork lift operator to unload (*Fig. 1*) and stack (*Fig. 2*) them in a matter of minutes. Meters arriving from the Rockwell Manufacturing Co. and Sprague Meter Co. plants in the East are not shipped in baskets. They are hand stacked on pallets, then transferred to baskets when shipped to division bases from the East Los Angeles warehouse.

Incoming shipments of regulators from American Meter's Reliance Regulator division plant in nearby Alhambra (Calif.) are delivered in wire baskets too (*Fig. 3*), making them easy to handle, store, and ship.

All eight Southern Counties division operating headquarters are equipped with either fork lift trucks or overhead cranes to handle the wire baskets. Outgoing meter shipments are made in the baskets (*Fig. 4*), and are not confined to conventional domestic size gas meters. The company ships meters up to the 100 light size in them.

All of the company's meter repair work is done at the central meter shop, located on the same property as the warehouse in East Los Angeles. Meters coming back to the meter shop for repair are shipped in the baskets (*Fig. 5*).

Use of the baskets has made shipping to division bases easier, too. Five of the operating headquarters are located in the metropolitan Los Angeles area—El Monte, Pomona, San Pedro, Santa Ana and Venice. The other three require longer hauls: Ventura (70 miles distant), Santa Barbara (100 miles), and Santa Maria (175 miles).

The great majority of the wire baskets now being used by Southern Counties were made by the Cargotainer division of Tri-State Engineering Co., Washington, Pa. ■

Fig. 5. Load of various size meters being sent to meter shop from one of Southern Counties eight divisional operating headquarters. Fork lift truck operator can unload this trailer in a very few minutes.

Problems arising with pipeline rights of way

By B. Z. KASTLER Jr., Attorney
Mountain Fuel Supply Co., Salt Lake City

IN approaching the problem of comparing various types of rights which might be obtained and utilized for pipelines, it is desirable to determine what ultimate objective is sought. Such a determination must take into consideration matters of safety, accessibility, expenditure required to obtain and maintain the right of way, permanency of the grant, public relations, and many other things. These matters all reflect, however, upon investment and income therefrom, and it can safely be said that that type of right is best which best protects the investment of the company in facilities installed therein. Certainly, all other things being equal, a permanent right of way is better than a revocable license since it better protects the company investment. In order to compare, however, I shall consider each type separately and endeavor to point out the strength and weakness of each type.

• Franchise rights

Circumstances of distribution as well as state laws often require a utility to obtain a franchise prior to introduction of gas service into a given city or county.[1] In such cases comparative criticism is of no value inasmuch as a franchise is a must. However, where choice exists, for example on a "through" transmission line, the use of franchise rights might be alternative to several other types of right.

Franchise rights are generally not exclusive in the sense that other like utilities would be prohibited thereby from operation in the same enfranchised area. The law frowns upon "exclusive priviledge" franchises.[2]

In addition, franchises generally run for a given period and then must be renegotiated or the right lost. Most states prohibit issuance of "irrevocable" franchise rights.[3]

However, once granted, a franchise, if duly and properly accepted, has the elements of a contract and such a contract has usually received protection under the "impairment of contract" provisions of the Federal Constitution.[4] It has been held, however, that the police and taxation power of a state may not be bartered away by a contractual franchise in the absence of very clear statutory authority therefor.[5]

As a consequence, a franchise may be said to give a contractual right to use the street which is irrevocable for the period of the franchise. However, this does not permit the use, for that period, of any particular portion of the street, and if the municipality must make changes (such as widening, change of grade, etc.) which interfere with the utility, then in the absence of specific statutes permitting reimbursement, the utility must relocate at its own expense to such new area within the street as may be designated.[6]

Since a franchise properly accepted may be considered as a contract, the consideration specified therein should not be changeable without consent of both parties. Some jurisdictions take the view that provision in a franchise ordinance for payment of consideration negatives the idea that any other or additional consideration may be exacted.[7] Other jurisdictions hold that although a consideration is specified in the franchise ordinance, this does not preclude the city from imposing other or additional considerations or taxes upon gross receipts of the utility such as license or occupation taxes. These later jurisdictions so hold on the theory that a city cannot by a franchise contract barter away its rights to license and tax.[8] Hence, it is possible that al-

though a utility might make annual payments for its franchise rights to occupy streets and ways, its rights may also be subject to other and additional charges.

Another matter affecting permanency of location under franchise has to do with vacating of streets and ways. When a city vacates a street, usually the property reverts to the owner or owners abutting the street from whose property the street was taken in the first instance. If streets are vacated without respect to the rights of utilities using the same, it might well be that the utility will find itself with facilities constructed pursuant to franchise rights which are located upon private property and for which the utility may have no right. This situation can be cured by persuading the city to vacate *subject* to the rights of utilities if this is legally possible, or by amending the state law to provide that the rights of utilities shall not be affected by vacating ordinances.[9]

Since franchise rights are usually exercised in more populous areas, safety is often a problem. The streets must be opened up, and the usual accidents involving such excavations crop up. A child falls in the trench or an automobile sinks in a trench or strikes a barricade upon which there are no lights, etc. More serious, however, are accidents arising from the use of the streets by other contractors. Often a contractor who is not familiar with operations in streets and highways will strike a gas line and kink or bend it. If it doesn't leak, he will cover it up. A year later when an explosion occurs, the gas company suddenly finds itself in a lawsuit. Though the utility often does not know of the leak resulting from the kink, plaintiffs endeavor to fasten liability upon them on the theory that the utility failed to adequately inspect its lines and discover the leak. Some jurisdictions have indicated that all the plaintiff need show is that there was a leak and that it resulted in damage to plaintiff.[10] Other jurisdictions have held that such is not the case and that the defendant must be shown to have been negligent.[11]

Whatever the legal result, an ounce of prevention is worth a pound of cure, and the utility should take steps to prevent such accidents from happening. Cities and counties should be urged to require that all persons excavating in the streets first obtain permits, and that as a part of the permit procedure, contact all utilities who may have facilities in the streets to determine their exact location. Utilities should cooperate by making drawings and other information freely available to any contractor requesting such information. Permitees should be made to pay fees sufficient to permit municipal inspection before the excavation is closed in order that interested companies may be notified if their facilities are damaged or endangered by improper support. Possibly bond and insurance should be required to protect the city and enfranchised utilities from such damage.

On the positive side, it can be said that franchise rights are relatively more convenient than rights taken across private property. If a good relationship exists between the utility and the city, good non-conflicting locations can be quickly established and the utility need not acquire a new right every time it desires to lay another line or extend existing lines in the streets. Good engineering practices and alert city planning can avoid many of the pitfalls attendant upon franchise rights. Long term franchise agreements may be negotiated which tend to reduce the hazard of frequent renegotiation. Political instability can usually be minimized by intelligent cooperation on the part of the utility. In many cases utility plant in the street is left undisturbed for many years although in some cases new plant must be removed and relocated at great expense to the utility. The latter type cases often arise because of poor city planning or inadequate liaison.

Although many other matters concerning franchise rights might be discussed, suffice it to say that generally locations so obtained are not permanent. Also, the cost of acquisition of such rights is never capable of definite ascertainment inasmuch as the holder may be subjected to other forms of licensing and taxation. Such rights are not exclusive and involve many safety problems. In addition such rights are not always freely assignable. All of these factors combined would result in avoiding the use of franchise rights if other suitable alternatives are available.

• License agreements

By their very nature, license agreements are not permanent since they merely amount to "permission" to utilize land until the licensor decides to revoke the permission. This is always true unless the license is coupled with an interest. Here again, however, such agreements are taken when there is little alternative as is the case with agreements permitting use of state highways. Since such agreements are primarily encountered with reference to use of state highways and railroad crossings, it might be well to consider the two types separately.

License agreements for grade crossings are generally very specific about removal and relocation at the expense of the utility and also generally carry very strict provisions governing liability of the utility should any accident occur with respect to the utility facility. Some agreements are so strict that they require the utility not only to absolutely guarantee the railroad against any loss, whether the utility is negligent or not, but also require the utility to waive any claim it might have against the railroad for damage the latter may do, whether negligent or not, to the utility. Such "hold harmless" clauses may not simply be ignored by the util-

ity since substantial liability might result. Consequently the utility is put to the expense of insuring its liability under such agreements in addition to paying rentals on the agreement and "supervisory" and "flagging" expenses which sometimes are quite substantial. If the utility wishes to avail itself of the services of an independent contractor to install the facility, the railroad frequently requires a similar agreement from the contractor, thus resulting in further expense to the utility. In addition, the utility may not "pass on" its hold harmless obligations to the contractor unless it specifically notes the provisions of the railroad agreement in its contract with the contractor.[12]

In view of the extreme one sidedness of such grade crossing license agreements, it would seem wise to consider condemnation of a right to cross, thus leaving the parties with the liabilities they would otherwise have to carry absent such a license agreement. This would offer the further advantage of permanency, thus protecting the utility from losses due to relocation and removal requirements.

Although some states provide by statute the right of utilities to utilize highways,[13] in most cases there are no specific statutory or constitutional authorizations, and the utility must occupy under terms and conditions specified by the highway authority. In almost all cases, utilities must accept license agreements providing for relocation at the expense of the utility and also for indemnification of the state. In some jurisdictions, highway authorities can probably grant no greater rights, and litigation would result if they tried. In other states, this is not so.

The Federal Aid Highway Act of 1956 (Public Law 627) provides that on federal aid interstate, primary and secondary highways, federal funds may be used to reimburse states for the cost of utility relocations provided such use does not violate the law of the state or a legal contract between the state and the utility. This law brings into sharp focus the practice of state highway commissions requiring utilities to *agree* to relocate at their expense, for obviously federal reimbursement funds could not be used in the face of such contractual agreements. The federal law also pointed to the necessity of amending state laws to permit such reimbursement. Several states, including Utah, have amended their laws to permit such reimbursement.[14] Passage of such laws has by no means solved the relocation problem, for in the states of Montana, Idaho, Utah and New Mexico, litigation is either pending or contemplated to test the validity of such laws. It is claimed that such laws (a) violate constitutional provisions forbidding appropriations to corporations not under the control of the state;[15] (b) violate constitutional provisions which limit use of highway funds to construction, maintenance and repair of public highways;[16] (c) violate constitutional provisions that the credit of the state shall not be pledged or loaned to any individual or corporation.[17]

Where the matter has been litigated, various results have been obtained. In Southern Bell Telephone & Telegraph Co. v. Commonwealth (Kentucky), 266 S.W. 2d 308, the court volunteered that relocation at the expense of the state would be unconstitutional.[18] A contrary result was reached by the New Hampshire court in upholding such legislation.[19] The attorney general of Oklahoma concluded such legislation was unconstitutional while the attorney general of Texas reached the opposite result.[20]

In view of the uncertainty surrounding the reimbursement provisions of the Federal Highway act and the fact that a bill has been introduced in Congress to repeal the reimbursement provisions of that act, utilities cannot hope for much relief respecting relocation costs until the respective highway commissions offer better agreements and state laws implementing federal reimbursement are thoroughly tested.

Although blanket license agreements have some of the same advantages of convenience as do franchise rights, they have no permanency and are largely subject to the same problems regarding safety as were discussed with respect to franchise rights. In addition they are fraught with "hold harmless" booby traps and are seldom assignable without consent of the licensor. Hence, such agreements should be avoided where any reasonable alternative presents itself.

• Easements on privately owned lands

Easements on private property are generally recognized as legal and enforceable rights in land. Since the rights and obligations of the parties are generally governed by provisions of the document itself, consideration will be given to the various provisions separately.

The term of an easement is usually perpetual although the right may be lost through abandonment or adverse possession. Many of such easements run for "so long as the pipeline and related facilities are operated." In some cases a definite term is specified.

Whether it is wise to take an easement in perpetuity or only so long as it is actually used may depend on plans for its immediate use.

Easement rights may be lost by failure to assert the right against an adverse or hostile use over a given period of time.

Easement interests are usually fully assignable without consent of the land owner.

Since rights on private land are not open to the public as a whole, many safety problems attendant upon street and highway locations do not exist.

However, some problems do arise.

Since most lines are laid below plow depth, few problems are here encountered unless the land is leveled and the pipe exposed or endangered. Since some courts feel the owner of the pipeline is obligated to put the line below plow depth on tillable land or bear the consequences,[21] it is wise to so construct the line and also to provide in the document of right of way that, among other things, the pipeline company has a right to a minimum earth cover of so many inches around and above the line. Right to maximum depth should be specified to protect against large fills.

Sometimes patrol of the line will disclose that the landowner or a subdivider has built or commenced building a structure over the line or so close as to constitute a hazard. If the building is over the line, the easement owner can usually compel its removal on the ground that it deprives the owner of his easement rights and constitutes a hazard.[22] Since some courts reach the opposite view,[23] it is wise to specify in the easement document that no building, enclosed structure or similar obstruction may be built over the line.

If the easement does not specify a given width, the problem of encroachments close to but not over the line arises. If no width is specified, courts usually allow a "reasonable" width.[24] What is reasonable may vary with the circumstances and therefore a definite width should be specified together with the provision prohibiting obstructions on any part of that width.

If a definite width is specified it is also prudent to provide that more than one line may be installed within the specified width as well as related facilities such as valves, taps, etc. If this is not done, installation of such additional facilities may be prohibited.

Sometimes rights of way are taken which specify no given course across land. In such cases the course usually becomes fixed (a) by agreement of the parties on a suitable location, or (b) by use of a particular way for a period of time with acquiescence of the grantor, or (c) by any party in whom the grant vests right of selection, subject to the requirement of reasonableness, or (d) by necessity of circumstances dictating one location as opposed to others which would annul, ruin or militate against the grant.[25] As can readily be seen, although such "floating" grants may be convenient to use in cases where definite course is not yet determined by the engineers, a host of serious problems and delays may result. The landowner may have planned a reservoir or an outbuilding over the route ultimately seized upon by the engineers. Such grants offer further difficulty in that recording fails to give the landowner or his purchaser a definite description of the easement, thus increasing probability of encroachment and necessity of marking and patrol.

Rights of way across private land, particularly if they specify a given course and width, prohibit buildings and obstructions, and permit additional facilities, give rise to public relations problems. If the original grantor sells the land and thereafter the right of way is further utilized for repair or construction of new facilities, the new owner is apt to be somewhat resentful unless he is remunerated for losses to his crops, etc. It is therefore prudent to pay less initial consideration for the grant and provide for payment of damages to growing plants, crops and fences. The damages clause should specify that the owner may use the property for any uses not inconsistent with the easement, and should carefully delineate the items for which damage will be paid. The measure of damage to growing crops is stated to be the value of the probable yield under proper cultivation less the probable cost of cultivation necessary to mature and market the crop.[26]

Another item affecting public relations arises out of representations or claimed representations made by right-of-way agents to landowners. After the easement is obtained and as construction is about to start, the landowner suddenly claims that the agent promised him something that he has not received. Some companies have attempted solution of this problem by inserting in large type on the right-of-way document provisions stating in essence that the persons securing the grant on the part of the grantee are without authority to make any representations, covenants or agreements not expressed in the document itself. Although such provisions may make easements more difficult to obtain, they clearly place the landowner on notice that the document expresses the full extent of the rights and obligations of the parties. Though this legally strengthens the document and tends to minimize claimed misrepresentations, it does not completely eliminate the problem.

To accomplish and maintain good relationships with landowners, it is prudent to notify them well in advance of any planned activity (other than the usual patrol) on the right of way. Care should always be taken to keep such owners fully appraised so that they may adjust water turns and take precautions with cattle, etc. Fences should be kept secure and properly repaired and the right of way cleaned up after construction. Trenches should not be left open unduly, and access gates should be securely closed. The easement owner should recognize that he is almost always an unwelcome guest and should strive to build up a relationship of trust and confidence.

Conditions of terrain create problems of accessibility, and easements frequently provide, in addition to the specified right of way, that the grantee have the right of ingress to and egress from the

right across other property of the grantor. Often such rights are not specifically described as to location and can be seriously misused. The interests of the landowner should be honored wherever possible, and contractors should be cautioned to cooperate in order to minimize damage, irritation and inconvenience. Such undescribed rights of access must be reasonably used.

In some cases it may be advisable to specifically describe access roads. This might minimize argument and has the further effect of definitely fixing the right so that future owners will not be caught unaware. When large tracts are later subdivided and sold, the new owners may rebel against use of their property for access to other property. Specific description, particularly where only one way of access is possible or feasible, is desirable.

Easements seem to be very desirable for underground or overhead structures. However, where crossovers or similar installations are installed above ground thus permanently depriving the landowner of the use of his ground, it would seem better to purchase fee title for the land so consumed. This would permit the utility to fence[27] such installations for their protection and would relieve the landowner of the burden of taxation he must bear on land useless to him.

• Property owned in fee

Whenever fee title is purchased for installation of pipelines, the owner acquires several obligations attendant upon fee ownership which seldom exist with respect to easement rights.

He must pay real property taxes on the value of the land owned.

He must keep his property up. A strip of land across fertile farm country cannot be left to grow into noxious weeds.

The strips are constatly being crossed, with or without right, by irrigation ditches, vehicular travel, other utilities, etc. To protect title, the owner must be diligent to detect such crossings and insist on adequate right given prior to crossing. Such is not the case with non-exclusive pipeline easements.

Such strips represent constant irritation to persons who must cross or whose lands are divided thereby. However, settlement for damages need not be made nor need the landowners be notified and prepared for construction or other activity thereon. Furthermore, the pipeline company can place unlimited structures above or below ground with impunity as long as zoning and similar laws are adhered to.

Since entire title is purchased, however, the initial acquisition cost is generally substantial.

• Conclusion

A properly drawn permanent easement across private lands, supported by thoughtful public relations plan, offers both security against premature relocation cost and against uncertain future acquisition or maintenance costs. Generally such easements bear little taxation and offer relatively greater safety. Although not always as convenient as franchise or blanket license rights, they are generally less expensive insofar as construction and repair costs are concerned in spite of crop damage clauses. They are freely assignable and are not fraught with "hold harmless" provisions as are franchise and license agreements.

Easement rights for pipelines appear to offer the greatest protection of company investment at the lowest cost and therefore are the most meritorious and problem free.

Fee ownership for above ground facilities such as valves and crossovers, etc., appears to be the most desirable and feasible. ■

REFERENCES

[1] Utah Constitution, Article XII, Sec. 8.

[2] McQuillan, Municipal Corporations, Secs. 1633, 1637.

[3] Article 1, Sec. 23, Utah Constitution.

[4] 148 A.L.R. 28. See also Trans World Airlines, Inc. v. San Francisco, CCA 9 Dec. 19, 1955, 228 F2d 473, Cert. Denied 351 US 919, 100 L.Ed. 1451, 76 S.Ct. 711, and Limoneira Co. v. Ry. Comm., 174 Cal. 232, 162 Pac. 1033.

[5] 173 A.L.R. 31, 157, 174 A.L.R. 44.

[6] Binghampton Gas Works v. New York State, 53 NYS 2d 545; New York Tunnel Authority vs. Consolidated Edison Co., 68 NE 2d 445; see also 251 N.Y. at page 351, 171 N.E. at page 566, and many cases collected in Highway Research Board Special Report #21, which can be obtained through the National Academy of Science, 2101 Constitution Avenue, Washington 25, D. C.

[7] Town of Joseph v. Telluride Power Co., PUR 1927 E 675; Ogden City v. Public Service Commission et al. 260 P 2d 751; Village of West City v. Illinois Commercial Telephone Co. 372 Ill. 493, 24 N.E. 2d 352; Crisfield v. Public Service Commission 36 A. 2d 705, 54 PUR (NS) 357.

[8] 173 A.L.R. 31.

[9] See 10-8-8.5 Utah Code Annotated 1953 as amended by Ch. 14, Sec. 1, Laws of Utah, 1955 providing that "franchise rights of any public utility shall not be impaired by . . . vacation or narrowing of streets or alleys."

[10] Sharkey et al v. Portland Gas & Coke Co., 74 Ore. 327, 144 P. 1152; Central Arizona Light & Power Co. v. Bell, 64 P.2d 1249; Chutuk v. Southern Counties Gas Co., 21 Cal. 2d 372, 132 P.2d 193.

[11] Musolino Le Conte Co. v. Boston Consolidated Gas Co., 112 N.E. 2d 250 where the Massachusetts court examined all past precedents in that state and established new law negativing the idea that a utility is responsible without specific showing of negligence.

[12] Southern California Gas Co. v. Ventura Pipe Line Construction Co., 309 P. 2d 849.

[13] Wyoming Compiled Statutes, 1945, Sec. 3-6201.

[14] Utah Code Annotated, 1953, 27-2-7 as amended by Laws of 1957, Ch. 53, Sec. 1.

[15] Article 4, Section 31, New Mexico Constitution; Article 5, Section 34, Colorado Constitution; Article 5, Section 35, Montana Constitution.

[16] Article 13, Section 1 (b) Montana Constitution; Article 10, Idaho Constitution.

[17] Article 8, Section 2, Idaho Constitution; Article 11, Section 1, Colorado Constitution; Article 13, Section 1, Montana Constitution.

[18] See also Macon v. Southern Bell Tel. & Tel. Co. (Ga.), 79 S.E. 2d 265, and Southern Bell Tel & Tel. v. State (Fla.) 75 S.2d 796.

[19] Opinion of the Justices, —— New Hampshire ——, (May 31, 1957), and Opinion of the Justices, —— Maine ——, (May 6, 1957).

[20] See Highway Research Board Special Report No. 21, National Academy of Science, 2101 Constitution Ave., Washington 25, D. C.

[21] Besser v. Buckeye Pipe Line Co., 13 N.E. 2d 927.

[22] See cases collected in 28 A.L.R. 2d 621 and in 6 A.L.R. 2d 205.

[23] Babler v. Shell Pipe Line Corp. (1940, D.C. Mo.) 34 F Supp. 10; Peoples Gas Light & Coke Co. v. Cook Lumber Terminal Co., 256 Ill. App. 357

[24] Salt Lake City v. Walker, 253 P.2d 365.

[25] **Ibid.**

[26] Burke v. Thomas, Okla. 1957, 313 P.2d 1082.

[27] As a general rule, easement rights alone may not be fenced. 6 A.L.R. 2d 210, sec. 4.

This article has been adapted from a presentation by the author at the PCGA Right of Way and Land Section, in November 1957.

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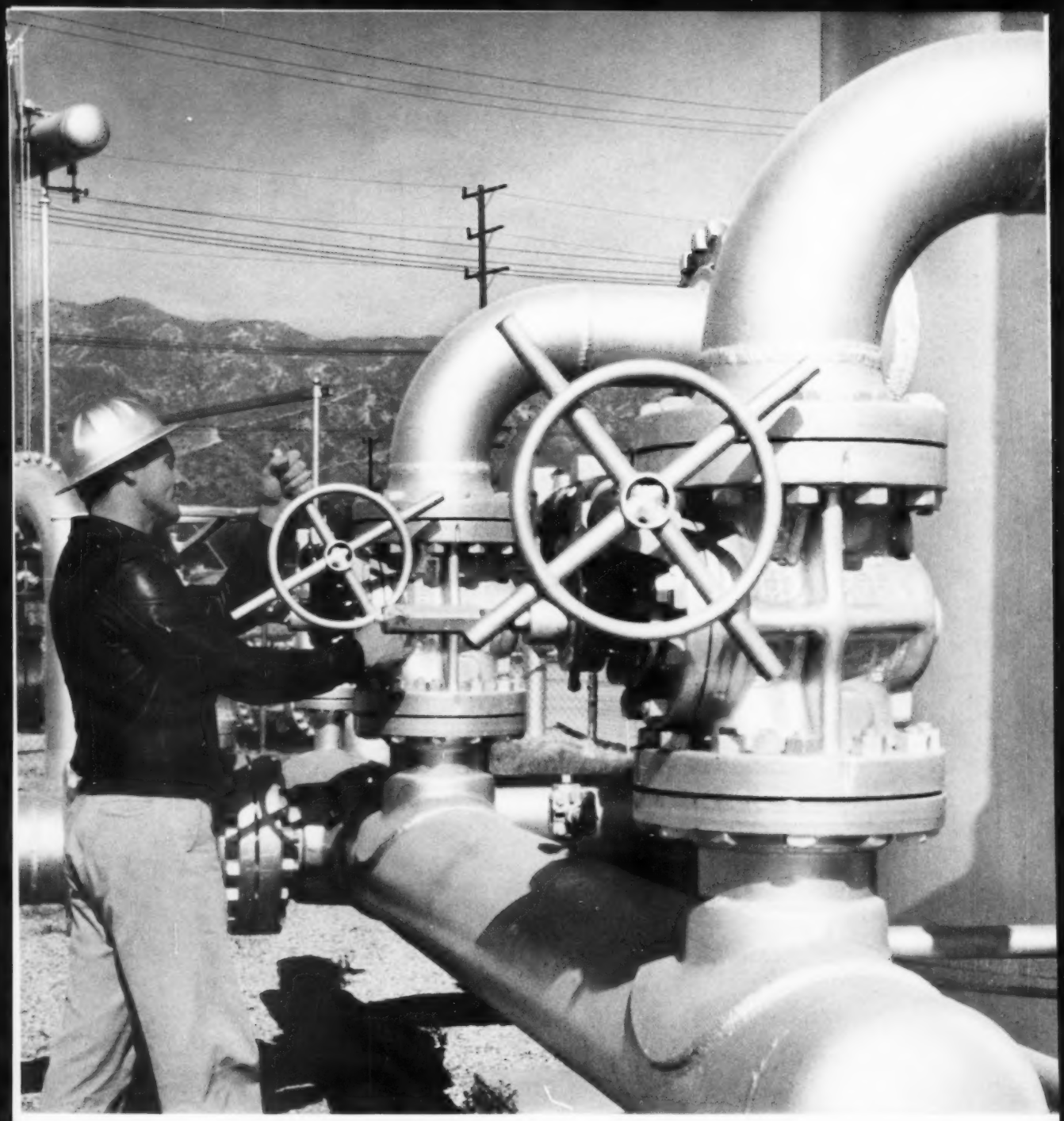

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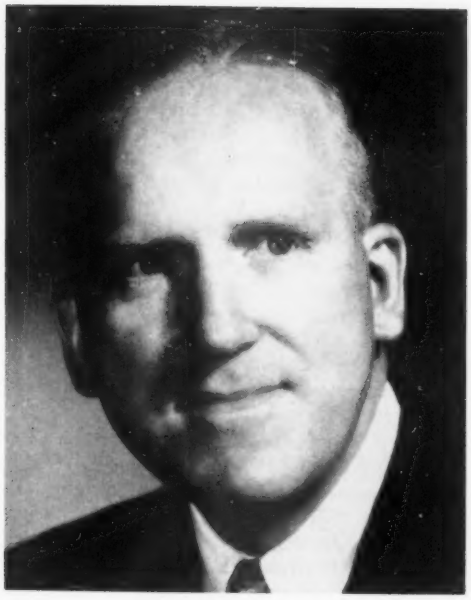

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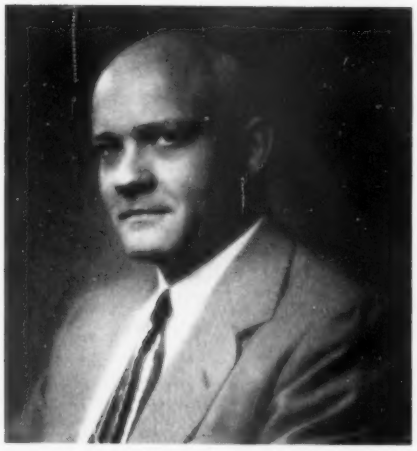

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TREASURER MILES

Appliance exhibits highlight convention

SOME 5000 industry leaders will see the first gas appliance exhibit sponsored by the AGA since 1952 when the "Parade of Gas Progress" is unveiled in Atlantic City this month. The occasion: the American Gas Association's 40th annual convention. The time: Oct. 13-15.

The Parade of Gas Progress will be educational rather than promotional in nature, according to H. Vinton Potter, chairman of the exhibit planning committee and vice president of Oklahoma Natural Gas Co. Exhibits will be devoted to gas utilization items which have become commercially available since October 1956 or soon are to become commercially available, and to prototypes of important new utilization devices still under development. (A preview of the parade appears in this issue of GAS Magazine.)

The Parade of Gas Research exhibits will show how projects are originated and developed in the laboratory. Displays by manufacturers will show how these research ideas are carried to the customer as products.

An impressive array of speakers has been lined up by A. M. Beebee, chairman of the general convention committee and chairman of the executive committee of Rochester Gas & Electric. Fourteen leading industry

leaders and guest speakers will address the three general sessions.

All utilization exhibits, general sessions, luncheon and section meetings will dramatize the convention's overall theme, "Gas Builds a Greater America." General session themes will be "What's Ahead" on Oct. 13, "Problems to Think About" on Oct. 14, and "Meeting Our Opportunities" on Oct. 15. Theme for the general luncheon climaxing the convention on Oct. 15 will be "A Time for Greatness—Making the Most of our Opportunities."

AGA President Robert W. Otto will open the convention on Oct. 13 when he addresses the first general session on the overall theme, "Gas Builds a Greater America." Other speakers during the session are Martin R. Gainsbrugh, chief economist of the National Industrial Conference Board, who will discuss the significance of current economic trends; Fulton Lewis Jr., Mutual Broadcasting System commentator; and James J. Healy, associate professor of industrial relations at Harvard, who will speak on "What's Ahead in Labor-Management Relations."

The Oct. 14 general session will be highlighted by the presentation of the AGA Distinguished Service Award and four addresses based on the day's theme, "Problems to Think About." Speakers and their topics include J. W. McAfee, president of Union Electric Co., "The Threat of Government Operation—Our Common Problem"; Joseph C. Bevis, president of Opinion Research Corp., "Myths, Management, and Money"; Edward R. Thornton, president of the National Association of Railroad & Utilities Commissioners, who will discuss current regulation problems; and Albert H. Gordon, partner in Kidder, Peabody & Co., "Financing Economics of Today."

The third and final general session, on Oct. 15, will begin with a brief ceremony honoring AGA's affiliated associations. Featured speakers include Whirlpool's chairman, Elisha Gray II, speaking on "Refrigeration —Key to Greater Sales," and Lyle C. Harvey, senior vice president of Carrier Corp., who will offer methods for advancing the gas industry's position in the air conditioning field. Other speakers slated for the third general session are GAMA President Clifford V. Coons, executive vice president of Rheem Manufacturing Co., who will speak on "Five High Roads to Sales Expansion," and W. M. Jacobs, vice president of Pacific Lighting Corp. and chairman of AGA's GID committee. He will review the latest developments in the gas industry.

Slated to speak at the final luncheon on Oct. 15 are Glenn W. Clark presidential nominee of the Inde-

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pendent Natural Gas Association of America, and AGA's managing director, C. S. Stackpole. Mr. Clark will outline how pipeline companies can help build a greater America and Mr. Stackpole will tell what the gas industry can and should do to capitalize on its opportunities.

In addition to the Distinguished Service Award, eight other types of achievement awards will be presented during the convention. They include the Distribution Achievement Award, the Beal Medal for the best technical paper presented at an AGA meeting during the year, the Operating Section Award of Merit, the Order of Accounting Award of Merit, the Safety Achievement Awards, the AGA Home Service Achievement Awards, the Industrial and Commercial Achievement Award, and the Public Relations Achievement Award.

All five sections of the AGA will meet during the convention. Section headquarters will be located in these hotels: accounting, Sheraton-Ritz Carlton; general management, Dennis; industrial and commercial gas, Traymore; operating, Claridge; and Residential gas, Traymore.

Mrs. Betty M. Rush, home service supervisor of Baltimore Gas & Electric and chairman of the home service committee, will preside at the annual Home

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Service Breakfast on Oct. 14 at the Hotel Traymore. An afternoon round-table session will be held the previous day at the Traymore.

AGA's accounting section will meet Oct. 13 for an afternoon session and again on Oct. 14 when a luncheon is scheduled.

C. F. Mills, Philadelphia Electric, as coordinator of the section's general activities group will preside at the Oct. 13 session. Speakers include Emanuel Toder, controller of Consolidated Edison Co. of New York, and chairman of AGA's application of accounting principles subcommittee. He will speak on the "Revised Bulletin No. 44 of the American Institute of Certified Public Accountants." James J. Mahon Jr., partner in Lybrand, Ross Brothers & Montgomery, will discuss current developments in federal tax legislation. Financial planning and control is the subject of E. A. Carlson, controller of Johnson & Johnson.

Presiding at the accountants' luncheon session will be L. J. Rauh, Baltimore Gas & Electric and chairman of the customer activities group. Speakers will cover "Employee Training—Here to Stay," "Rate Determination Factors," and "The Need for Long-Range Forecasts." The Order of Accounting Merit will be presented at the luncheon and Section Chairman Donald W. Peterson, secretary-treasurer of Minneapolis Gas Co., will present his report.

At an Oct. 14 luncheon of the General management section, T. W. Bradshaw, vice president of Atlantic Refining Co., will discuss modern concepts of management and company organization. At the same luncheon, AGA President Otto will present the public relations and safety achievement awards.

The industrial and commercial gas section will hold an afternoon meeting on Oct. 13 at the Traymore. Robert H. Willis, assistant to the president of Stone & Webster Service Corp., will speak on the advisability of establishing summer rate structures designed to increase gas air conditioning sales and attract other industrial business. "Magnifying Manpower" is the subject chosen by speaker F. Alexander Magoun, personnel consultant.

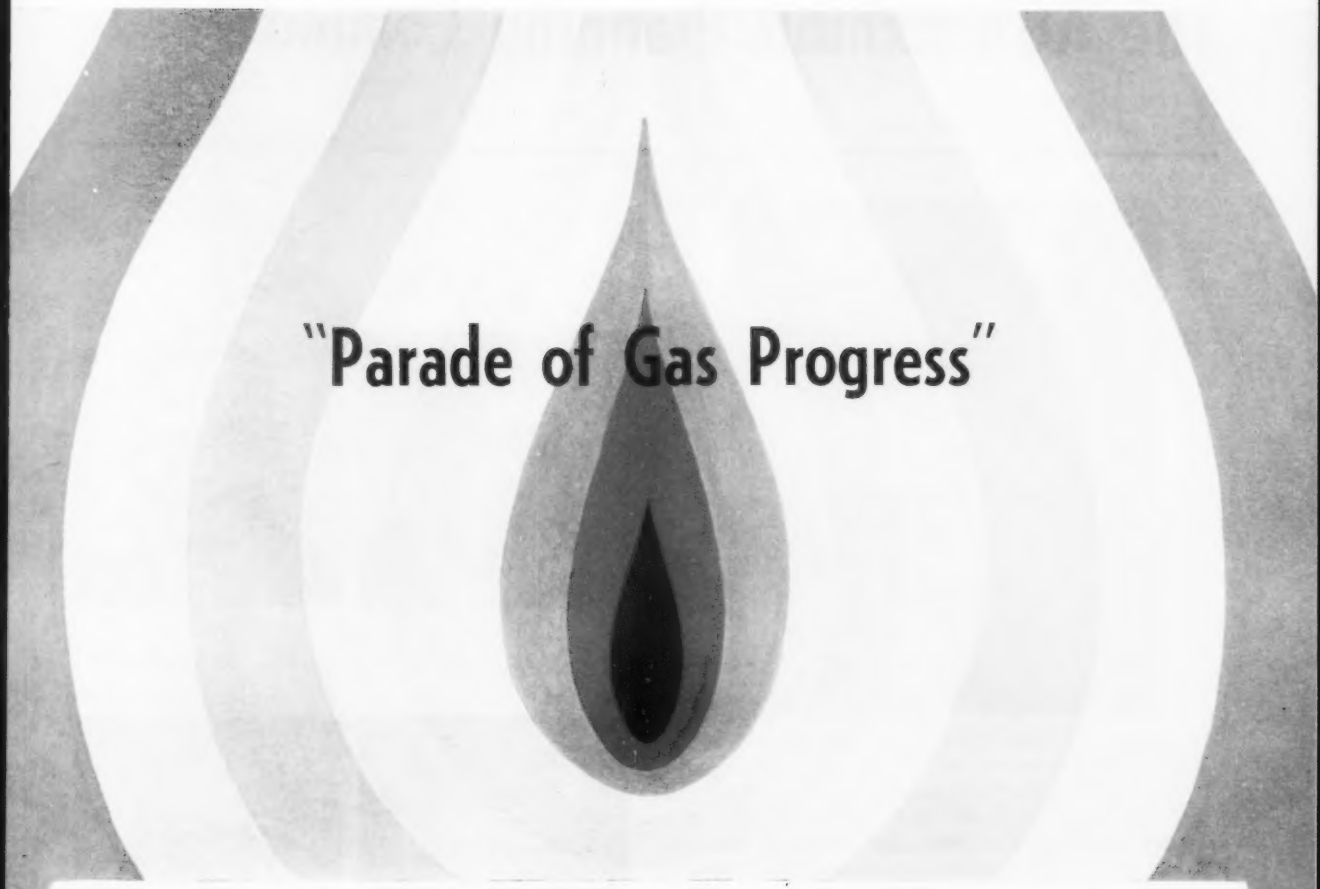
Delegates attending the industrial and commercial session also will hear a discussion of new equipment and markets.

Two afternoon meetings are scheduled by the operating section at the Hotel Claridge. In addition to a program of addresses, the section will present an exhibit outside the Convention Hall ballroom to provide delegates with the latest information on standard purchase specifications for small diaphragm-type gas meters meeting new AGA standards.

The residential gas section will meet on the afternoon of Oct. 14 in the Hotel Traymore. Highlights of the meeting will be presentation of the Home Service Achievement Awards and the introduction of Miss Julia Meade and the newly crowned Mrs. America, Mrs. Helen Giesse of Cleveland.

Fred A. Kaiser, Michigan Consolidated Gas Co., will speak on "The Time Is Now."

Social events during the three-day convention include the president's reception and gala slated for Monday evening, Oct. 13, and the ladies' luncheon and style show on Tuesday afternoon, Oct. 14. ■



"Parade of Gas Progress"

Exhibit will feature significant new technical developments in gas utilization

THE "Parade of Gas Progress" exhibit will be one of the highlights of the 40th annual convention of the American Gas Association. The exhibit area in Atlantic City's Convention Hall will be open daily during the AGA sessions October 13-15.

The "Parade of Gas Progress" will be educational rather than promotional in nature. Exhibits will be devoted to gas utilization items which have become commercially available since October 1956, or soon are to become commercially available, and to prototypes of important new utilization devices still under development.

Participation in the exhibit is by invitation from the Exhibit Planning Committee.

On the following pages, GAS lists and describes many of the exhibits which will be shown at Atlantic City. Because of publishing deadlines, those companies who accepted invitations at a late date could not be included.

The AGA Exhibit Planning Committee

H. VINTON POTTER
Oklahoma Natural Gas Co.
CHAIRMAN

THE AGA's Exhibit Planning Committee, headed by H. Vinton Potter of Oklahoma Natural Gas Co., set up this year's "Parade of Gas Progress" for the AGA Convention.

In addition to the "Parade of Gas Progress," this committee also arranged for two other outstanding exhibits. These will be a "Parade of Gas Research" and a "Parade of New Freedom Gas Kitchens and Laundries."

The "Parade of Gas Research" exhibits will demonstrate how projects are originated and developed in the laboratory. Displays by manufacturers will show how these research ideas are carried to the customer as products.

"Parade of New Freedom Gas Kitchens and Laundries" will feature the latest kitchens and laundries designed by leading shelter magazines in cooperation with cabinet manufacturers.

Another exhibit will be the AGA's dramatic new Multimatic Wall, which combines gas cooking, laundering, refrigeration, water heating and house heating in one compact unit.

Also scheduled for display at the Convention will be an exhibition of the AGA's own gas research projects.

JULIUS KLEIN
Caloric Appliance Corp.

CHRISTY PAYNE, JR.
Peoples Natural Gas Co.

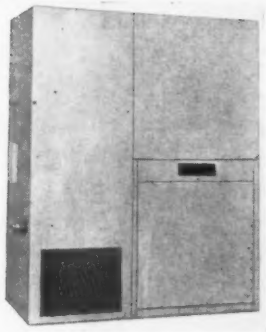
J. J. QUINN
Boston Gas Co.

P. R. SHEA
So. Calif. Gas Co.

FRANK H. TREMBLY JR.
Philadelphia Gas Works

"PARADE OF GAS PROGRESS"

AIR CONDITIONING



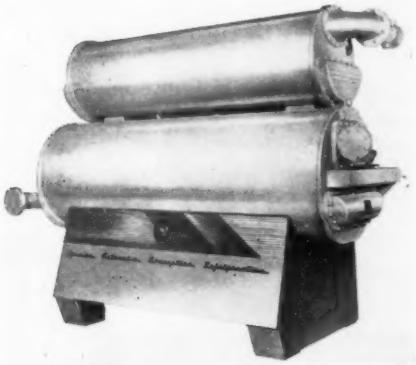
• *Arkla Air Conditioning Corp.*

Sun Valley All-Year Air Conditioners heat and cool in a single unit, automatically cleaning and circulating while maintaining a temperature level in winter, or cooling, dehydrating, cleaning and circulating in summer.

The single unit, operating on the absorption principle, functions without moving parts. Available in two sizes, the Model 500 provides 3½ tons, occupying 10 sq ft of space, cools or heats up to 1900 sq ft of area. The model 750 provides 5 tons, requiring one additional foot of space, handles up to 3000 sq ft. A thermostat affords choice of cooling, heating or independent air circulation.

Units are quality and capacity tested, and bear the AGA Seal of Approval and meet all national standards of the American Standards Association.

Principal components are an absorption combination refrigeration and heating unit, a filter section, and a blower. A gas flame supplies heat to actuate the absorption unit.

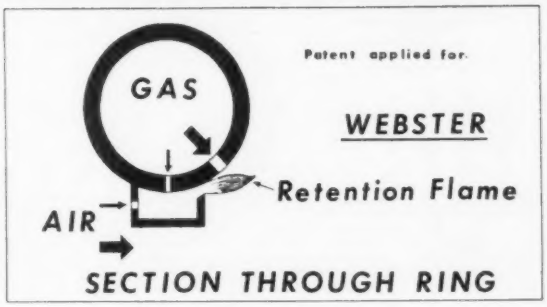


• *Carrier Corp.*

The Carrier automatic absorption refrigeration unit is a heat-operated refrigerating machine, using low-pressure steam, high temperature water, hot petroleum or other liquids as an energy source to produce chilled water for air conditioning or process cooling applications. Water is used as the refrigerant and safe lithium bromide as the absorbent.

Operation can be fully automatic from full load down to zero capacity. There are no major moving parts, and because the machines are relatively light in weight, extremely compact and practically vibrationless, they may be installed on roofs or intermediate floors with no need for expensive foundations. Cooling capacities range from 60 to 705 tons.

BURNERS



• *Webster Engineering Co.*

A unique application of the historical "stick-tight" burner nozzle principle to the formerly unstable ring gas burner has resulted in the Webster flame retention ring gas burner with positive, continuous ignition under all conditions. There is no total pre-mixing. A small percentage of the raw gas enters the annular space under the retention band and is there mixed with air entering through the weeper ports on the back side of the band. The ribbon of flame produced at the exit of the annular space furnishes constant ignition to the main gas supply without regard to flow conditions of either gas or air. The results are astonishing, and this patentable conception promises to cause a minor revolution in the heavy commercial and industrial burner fields. Tremendous inputs are possible in small spaces and combustion is quiet and stable at all rates of air flow from high excess to a deficiency.

COMMERCIAL EQUIPMENT

• *Gifford-Wood Co.*

The Unifryer is a scientifically designed fryer combining stable fat temperature for perfectly fried foods with automatic features that mean faster frying, greater production and lower operating costs.

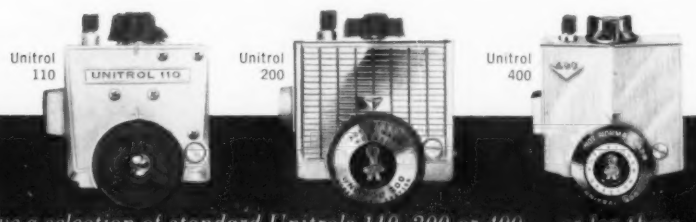
The secret of the Unifryer lies in its continuous

out of the blue sky.....

ROBERTSHAW brings you

*water heater UNITROLS with pressure

- Increase gas burner ratings
- Improve ignition performance
- Make components more compact
- Simplify assembly



Now you have a selection of standard Unitrols 110, 200 or 400 . . . or for these additional benefits, specify the Unitrol 110 R Unitrol 200 R or Unitrol 400 R !

...into reality!

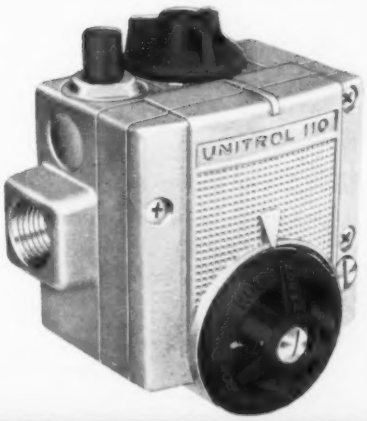
the R* series!

UNITROL 400 R
The smartest way to boost sales, the ultimate in appearance, dependability and efficiency . . . plus a new built-in pressure regulator.

UNITROL 200 R
The **smarter** control with the stepped-up appearance to step-up sales . . . **plus** a new built-in regulator!

regulators built in!

Robertshaw announces the most advanced *new* water heater controls ever engineered—the R * series . . . new Unitrols featuring built-in pressure regulators to increase your water heater ratings and sales! The basic Unitrol functions of thermostatic gas valve, main gas cock, 100% automatic pilot, pilot adjuster and pilot filter are included in combination with a built-in pressure regulator.

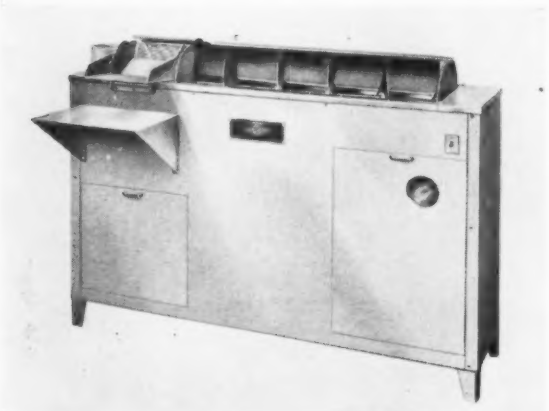


UNITROL 110 R
The smart, low cost water heater control featuring the dependability and savings of the Unitrol 110 . . . **plus** a new built-in pressure regulator!

INQUIRE TODAY . . . CONTACT

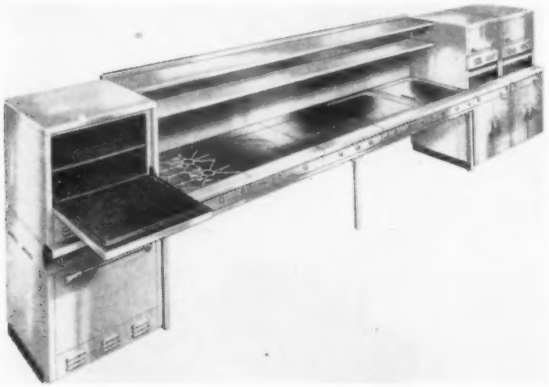
Robertshaw-Fulton CONTROLS COMPANY

GRAYSON CONTROLS DIVISION · LONG BEACH · CALIFORNIA



operation, as opposed to the single load operation of conventional fryers. Each portion is inserted when it is ordered, and automatically removed when it is cooked. Different foods starting to cook at different times all fry simultaneously with no transfer of flavor.

The food is carried slowly through the fat by a screw conveyor. As each load is properly cooked, it is automatically lifted from the fat, drained, and deposited on a delivery chute. No attention is required.



• *Malleable Steel Range Mfg. Corp.*

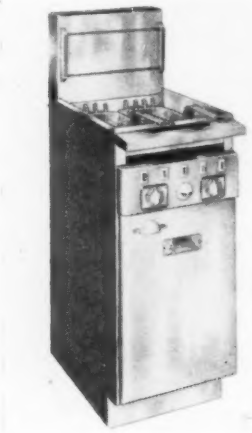
Three types of new Hi-Speed commercial gas range tops assembled into a new compact table-top assembly will be shown by South Bend. Hi-Speed burners for these units, representing the only basic improvement in burner principle in recent times, are from "application of designs developed under the PAR Research Program of American Gas Association."

Both the burner head and venturi areas are larger than for conventional type burners to accommodate additional quantities of both air and gas. Air and gas mix thoroughly in the venturi and lower burner head compartment before passing into the upper burner head compartment.

The gas mixture then first enters ports located at the bottom of the upper compartment of the burner head and passes through an area between an inner and outer wall of the burner head. This mixture ignites and establishes a "retainer flame" ½ in. below the main burner ports.

The "retainer flame" retards the upward flow of secondary air to the main burner ports, thus holding the Hi-Speed flame tightly to the burner.

Some Hi-Speed burners develop as much as 90 per cent more heat than certain conventional type burners. In addition, the turn-down quality of the Hi-Speed burner is excellent.



• *Specialities Appliance Corp.*

The Keating Trump Special fryer controls the temperature of the fat during the most critical period—the time the food finishes frying—as well as during the whole cooking process. Latest technical developments producing this performance are designed to fry superior quality food.

The 14-in. fryer has a gas input of 115,000 Btu per hr, which enables pre-heat time reduction to less than five minutes. Also, this tremendous input gives this appliance a very large capacity for frying food.

CONTROLS

• *Robertshaw-Fulton Controls Co.*

The "Burner with a Brain" has revolutionized the kitchen range, and has done a most acceptable job in doing it. The new Robertshaw-Fulton Thermal Eye with its new Flame Set feature takes technical development of this controlled top burner to a new stage.

In some cases, the users of Burners with the Brain have not been able to adapt the size of the burner flame to the size of the utensil (particularly small utensils) and, more important, have not been able to reduce the amount of heat to non-aluminum utensils

as recommended by their manufacturers.

The Flame Set feature permits the homemaker to select flame height and cooking temperature to suit the size, shape and material of the cooking utensil. Also, universal temperature charts are available for the first time that take into account the relatively low heat conductivity factor of non-aluminum utensils as compared with those of aluminum.

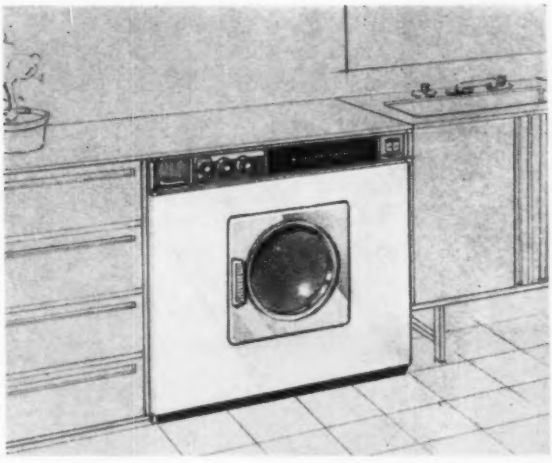
On exhibit also is this company's new type of automatic pilot which is mercury actuated and which has been developed specifically for the gas industry as a device that will assist meeting the AGA Automatic Ignition Requirements, effective Jan. 1, 1959. This unit is very economical and has no "red buttons" to be pushed nor "strings" to be pulled to restore it to operation. Lighting a small stand-by pilot is all that is needed.

DRYERS

• *Norge Division, Borg-Warner Corp.*

A full line of gas-fired appliances is the highlight of Norge's exhibit at AGA's "Parade of Progress." This includes the company's new gas refrigerator, or at least it was making every practical effort to have it available for exhibit as we go to press.

The Norge gas clothes dryer (Model DG-500) features a "fabric formula control." This permits the user to turn a dial to the type of fabric to be dried so that controls can then be set by "following the dots." Another new technical development is the "stop 'n dry" control which stops the cylinder for either of the two stationary methods. This control is visually displayed with an indicator light on the backboard.



• *O'Keefe & Merritt Co.*

The company's new built-in washer-dryer combination is designed for undercounter, elevated wall, or cabinet installation. The new model has front access to all controls and electrical devices, pilot and main burner, all service connections, except moisture exhaust. A new slide-in moisture exhaust connection and front lint screen afford fast, simple installation and easy removal.

This new built-in—as the free-standing model released early this year—features Stedi-Speed action with no vibration or spin. With no spin and a special Wash-n-Wear setting, all laundry problems disappear. Fabric-keyed dials, plus automatic water level control and drying time regardless of load, fabric or room humidity, make washday easy. Simple design for maximum reliability and ease of servicing—least complicated combination yet.

GAS LIGHTS

• *Arkla Air Conditioning Corp.*

Arkla Air Conditioning Corp. has introduced a new

1932

1933

1935

1938

1950

THERMAC

HM COMPANY

14296 E. 6th Street • Corona, California

Redwood 7-3511

Research Laboratory

Our 25th Anniversary

-- a new factory

-- a history of growth

Thanks to our customers and friends

Almost everyone reading this announcement of our 25th anniversary and our new factory is closely associated in some way with the gas equipment industry, and for that reason has known the name Thermac for a good many years. A large majority of the leading gas appliance and furnace manufacturers in the nation are among our valued customers. This list of manufacturers, in fact, reads like a "WHO'S WHO IN AMERICAN BUSINESS," and to these we are most grateful for the progress Thermac has made during the past twenty-five years. Our growth was occasioned not only by the addition of new customers but by the special needs of regular customers for new, improved and lower cost gas control equipment.

It seems that we spend an unusually large amount of our time and resources in the development of new controls and tooling facilities to provide these controls on a mass production basis with the resultant low cost. We have worked closely with nearly all of the leading appliance and furnace manufacturers to improve the performance and to lower the cost of control equipment. Quality and performance have not been sacrificed to meet competition. But rather quality and performance have been improved through increased efficiency, ingenuity and automation. This, in addition to supplying the finished product anywhere in the nation in the fastest time possible. In short, our slogan of "Service is our job—on-the-spot engineering assistance and immediate delivery" is being further realized through continuous research, development and improved manufacturing techniques made possible with our new factory which houses under one roof every facility from foundry to final inspection.

For these twenty-five years of continuous growth and progress we again say "thanks" to our many loyal customers, employees and friends.

Sincerely,

H. McKinley

President

Main Plant
TODAY

product for outdoor lighting, the "Gaslite," which operates on natural gas, butane or propane. The Arkla Gaslite is available in three styles, the "Cabildo," the "Flair," and "Heritage," each providing a non-irritating light for home or place of business, and adaptable for pipe or post installation. Gas consumption approximates that of a gas range, in maximum use burns per day.

Installation of the lights is simple, requiring no costly, extensive training for the service and installation personnel. Basic parts consist of sturdy, metal base assembly providing the foundation for the glass shield panels; a precision-tooled control burner assembly allowing constant burning of the gas and proper illumination; a top assembly with shield to protect the interior of the lamp from rain and wind. A white mantel of woven aluminum oxide produces the illumination. Each light is shipped from the factory almost completely assembled.

• *Equitable Gas Co.*

The Veritas lanterns are modeled after the most gracefully proportioned of the older American lamps. They are made of enduring copper, wrought iron, and brass.

Special features include unique polished brass counter-balanced latch, protective valve, and removable tamper-proof key. There is also a hinged top for easy cleaning, hinged door for easy lighting, and an adjustable orifice that makes the lantern adaptable for various pressures and types of gas.

As a new unique source of revenue, the yearly consumption of the lamp is about as much as that of a kitchen range and about twice that of a gas clothes dryer.

The post lantern measures 12 in. by 12 in. square and is 26 in. high. The copper frame is surmounted by a golden eagle.

• *Modern Home Products*

The "Charmglow" gas lamps are manufactured in copper. However, they can be supplied in this finish or in black.

A pressure regulator is installed on all lamps. The burners are machined and an access door is provided in the side of the lamp. This feature, an exclusive with the "Charmglow" lamps, makes this appliance easier and safer to service. Gas input is about 2200 Btu per hr.

This manufacturer makes a lamp post to complement the lamps. The post is telescopic for quick, easy installation under a wide range of conditions. There is no forcing necessary to get the gas supply line into the post. The copper supply line can be cut to desired length and attached to the lamp while the upper section of the post is in lowered position.

"Charmglow" gas lamps are represented nationally by Walter T. Moran, Chicago, Ill.

• *Hadco Aluminum Products Co.*

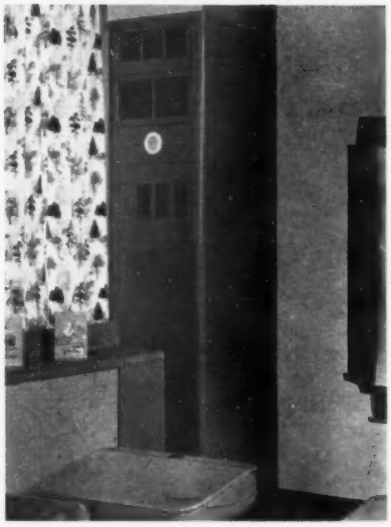
Modern engineering and old-world design are combined in the Yorktowne series of gas lights. The Hadco design is based on one-piece aluminum castings which produce simple and lasting construction.

The burner is a fixed orifice type. A filigree gallery chimney-type holder is an integral part of the burner. The burner assembly is a straight line, vertical, bunsen type. It is fitted with a shut-off valve and can be purchased with a pressure regulator installed. Proper

input is maintained with a regulator setting of 0.5-in. w-c for natural gas.

The lantern body can be passed over the burner assembly unit. It seats into bayonet slots located in the lantern base, and is locked in place with set screws. With the lantern body removed, chimney, mantle, shut-off valve, and controls are exposed for easy servicing and remantling. This design applies to all Yorktowne models—post-, bracket-, and pier based-mounted styles.

HEATING EQUIPMENT

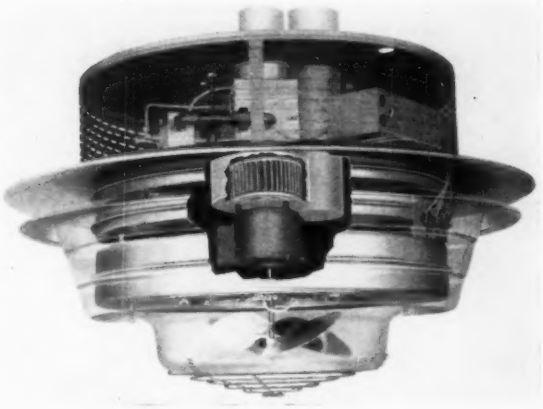


• *American Air Filter Co., Inc.*

This is the Herman Nelson direct gas-fired unit ventilator rated in accordance with ASHAE Standard Code for testing and rating unit ventilators. This is one of many unit ventilator systems designed to meet the specific, unique requirements of schools.

Keeping schoolrooms comfortable is a special problem. A large amount of heat is generated in schoolrooms because of the density of occupation. And lights and sun, even in the winter, add more heat. For these reasons, keeping schoolrooms comfortable becomes primarily a ventilating and cooling problem.

Unit ventilators for schoolrooms must have engineered draft protection, rapid heat, and air for ventilation or air for cooling (with outdoor air) on an individual classroom basis.

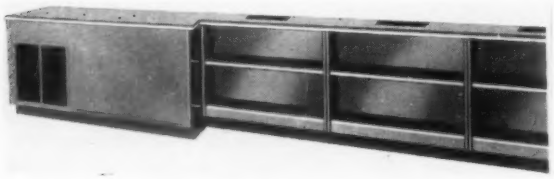


• *Norman Products Co.*

Norman-pioneered sealed combustion system operates completely independent of room air. All combustion air enters unit from outside through inlet pipe. All exhaust gases and combustion products are vented to outside under positive pressure through separate pipe. Exclusive automatic electric pilot ignition is programmed by thermostat. The Norman Three-Sixty is a basic departure from conventional atmospheric type unit heaters. Double-shafted motor operates 14-in. diameter fan to propel air through unit and squirrel-cage blower to pull products of combustion through heat exchanger and force flue products out through flue pipe. Radial-Flo models draw return air in through bottom and gently distribute complete circle of warm air downward and outward from top air diffuser. Down-Blo models deliver warm air with high initial velocity directly through bottom of unit. Eighty-five thousand and 115,000 Btu per hour inputs available in both types. Units can be suspended flush or non-flush to ceiling and vented vertically through roof or through side of building with horizontal run up to 35 ft.

• *Norman Products Co.*

Norman gas-fired, warm air schoolroom system utilizes 100 per cent outside air for combustion. Exclusive damper assembly operates outdoor and indoor dampers automatically to blend fresh and recirculated air. The Norman thermostat automatically cycles the gas burner to supply heat, and modulates the damper motor for ventilation to maintain even classroom tem-



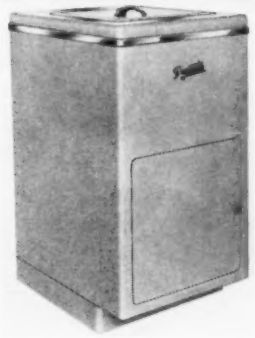
perature. Individual Norman schoolroom packages are available with inputs of 85,000 or 100,000 Btu per hr. Furnaces for Norman schoolroom systems have ceramic-coated heat exchangers; silent gas valves and 24-v, pre-wired controls of the latest type listed by AGA. Individual central heating units are available for both left- and right-hand installation and can be easily connected to flue in partition wall. Util-i-Duct bookshelf sections and optional, compact Wall-i-Duct sections have vertical discharge perimeter diffusers with locking dampers and adjustable controls. Matching corner, filler and end sections are available for either air distribution system.

• *Suburban Appliance Co.*

Power-vented heaters that need no flue or vent are featured in the Suburban exhibit. They are designed for installation where flues, chimneys and ducts work are costly, undesirable or impractical. Both the Novent and Dynavent lines are fully automatic. They use only outside air for combustion. And all products of combustion are exhausted outdoors.

Gas inputs for the three models are 20,000, 35,000, and 45,000 Btu per hr, respectively. The 20,000 Btu model is 14.00 in. wide, 14.50 in. high, and 22.75 in. deep. It fits between wall studs without framing. Both the 35,000 and 45,000 Btu models are 19.875 in. wide, 16.875 in. high, and 23.75 in. deep.

INCINERATORS

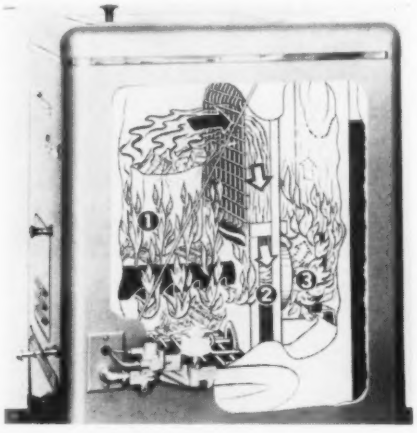


• *Bowser, Inc.*

The Bowser SM-2 Smogmaster is a 1.75-bushel capacity, tertiary chambered, smokeless and odorless, controlled combustion, domestic incinerator. A 34,000-Btu per hr inshot monoport burner is employed in conjunction with a stainless steel tunnel and hydroxylating chamber. The refuse is dehydrated, ignited and consumed through a combination of convective, conductive and radiant heat. The combustion products from the charging chamber go into a down-pass chamber, and through the gas flame into the highly heated hydroxylating chamber where they are burned completely.

For safe and trouble free operation, a fully protected 900 Btu per hr non-primary aerated pilot burner is employed with a 100 per cent shut-off thermomagnetic safety valve.

Through the induction of cooling air into the fully insulated cabinet, housing surface and flue gas temperatures are maintained at safe levels. The burning cycle is variable and controlled by a clock timer having a maximum setting of four hours.



• *Calcinator Corp.*

The Calcinator Imperial smokeless and odorless unit

Dixie TRIUMPHS IN SPACE

with the *gas* foldaway

Folds DOWN for cooking space — Folds UP for counter space.

SEE DIXIE'S TRIUMPH IN . . . THE PARADE OF PROGRESS AT THE A.G.A. CONVENTION

NO GREATER VALUE THAN THE DIXIE LINE.

DIXIE PRODUCTS, INC., CLEVELAND, TENNESSEE

DIXIE

features a three-stage corrugated combustion chamber, plus a unique multi-flame burner for both primary and secondary combustion.

Here's how the burning process works (see photo):

In (Fig. 1) the refuse is consumed and ash drops down on grate. Smoke and odors are passed over baffle into the second stage (Fig. 2) where they contact afterburner flame and pass into "afterburning" chamber (Fig. 3).

Gases are reburned and fly-ash settled out by a twin cyclonic action.

Other features include tip-toe door opener, automatic door closer, built in coolant air diverter, shaking and dump grate, insulated case and floor baffle. The AGA-approved unit is 18 in. wide, 24 in. deep and 35 in. high.

Gas input is 30,000 Btu on burner plus 200 Btu on pilot. Capacity is 1.5 bushels and uses a 100 per cent safety shut-off timer control valve.

• *Caloric Appliance Corp.*

This automatic gas disposer is a top loading appliance. In the refuse chamber, a "jetstream" gas burner changes the garbage by distillation to gaseous elements (smoke and odor) and ash. Ashes collect on the grate to be dumped into the ash drawer below. Smoke and odor are drawn downward by "jetstream" air flow in the unit. They travel through a combustion tube where the gas flame "eats up" the smoke and odor. The remaining smoke and odor go up the auxiliary combustion chamber where they are completely consumed. Fiber-frax high-temperature radiants in this chamber assure sufficient combustion to eliminate smoke and odor in any quantity.

Automatic draft control lets in cool air which goes up the dilution flue at the back of the disposer and mixes with the hot air coming from the auxiliary combustion chamber. Finally, out the stack comes the clean, smokeless, odorless air.

• *Locke Stove Co.*

The Warm Morning gas incinerator, Model L-16, achieves virtually smokeless-odorless disposal of garbage and trash by means of a two-stage incineration process utilizing a primary and secondary burner.

Flames from the primary burner consume the load, reducing it to a small amount of powdery ash which sifts through the grate openings into the container below. Products of combustion from the burning refuse pass over and under a series of baffles and through the flames of the "after-burner" where smoke and odor are consumed before they reach the flue outlet.

The Model L-16 Warm Morning has a firebrick lining that is guaranteed not to rust, buckle or burn out. The heavy cast iron top and insulated feed door are finished in dark green porcelain enamel. The body has a metallic green finish of heat resistant silicon enamel.

The main burners are controlled by a combination automatic burner timer and 100 per cent safety shut-off valve.

Capacity of the Model L-16 is 1.6 bushels. Total input with main burner operating is 38,000 Btu per hour. The unit is AGA approved under the 1958 Smokeless-Odorless Requirements for use with all popular types of gas.

• *Majestic Co. Inc.*

Smoke and odor produced in the combustion chamber of this new gas-fired incinerator are consumed by flame in a stainless steel "Turbo" combustion chamber before entering the flue. A venturi flue collar inspirates air into the flue pipe from the casing interior and mixes it with the hot flue gases. Thus, smoke and odors are eliminated, and a reduced stack-gas temperature is maintained.

Capacity of the appliance is 1.5 bushels of waste charge, which is flamed in a steel rod assembly, producing good free air passage around the charge. The air flow and downdraft boost operating efficiency of the combustion chamber. Combustion efficiency is supported by a stainless steel radiation plate—

"got a good name..."

this new *fan and limit control**. Ought to be worth something in our pitch to the field. Gives us a quality story... and the outfit's got branch offices from here to the DEW line. This is something we can sell to our key distributors. These guys know what a strong field service organization means in a pinch. Won't cost us any more than the one we're using now—so let's give them a try on the next run. Better get off a bulletin to our field men tomorrow."

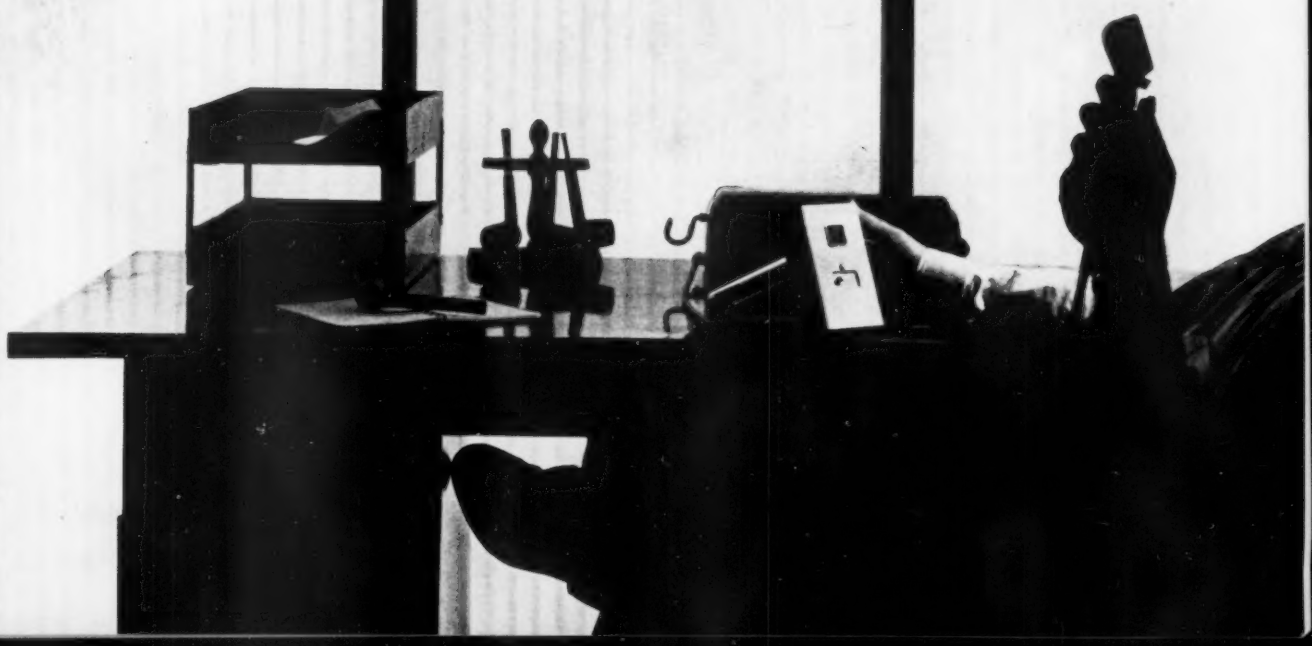
* ***The General Controls L-44 is available in 3 models: fan control, limit control, and combination fan and limit control.*** *Gives you competitive price advantages, famous-name backing, and 42 factory branch offices. Write today for full information, or check the yellow pages for your nearest factory branch office.*

GENERAL CONTROLS

Manufacturers of America's Finest Automatic Controls for Home, Industry and the Military

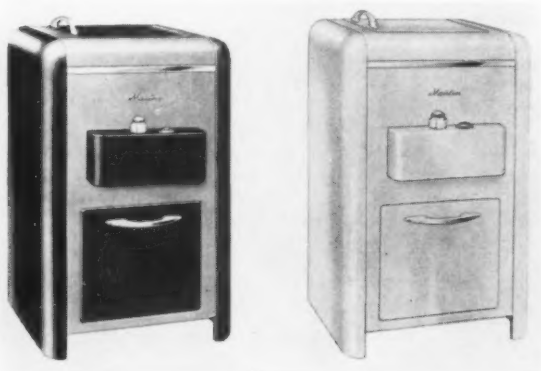
Glendale, Calif. • Skokie, Ill. • Guelph, Ontario, Canada

Six Plants—42 factory branch offices serving the United States and Canada



mounted inside the loading door—which reflects heat down on the trash load. Input rating (Majestic SSO-8) is 30,000 Btu per hr; pilot burner input is 800 Btu per hr.

An automatic clock-timer and pilot safety button are mounted on a back panel. A built-in gas pressure regulator and 100 per cent safety shutoff are designed in for gas control. The unit is attractively appointed and has many convenience features.



• *Martin Stamping & Stove Co.*

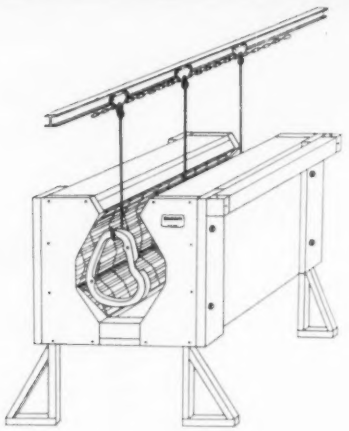
A cylindrical inner unit is a unique feature of the Martin incinerator. The design prevents warpage and deformation under elevated temperatures.

An integral "T" shaped main burner is fired directly under the waste charge with 12,000 Btu per hr. Smoke, odors, unburned bits and combustion products are conducted through a "curtain" of flame from a 23,000-Btu burner in a rear combustion chamber prior to exiting through flue pipe. Thus, the incinerator is both smokeless and odorless.

A barometric draft control is built-in. No further draft control in the flue pipe is required.

Other features are high-temperature resistant porcelain enamel finish, simple installation, full insulation, and complete automaticity.

INDUSTRIAL EQUIPMENT



• *John J. Fannon Products Co.*

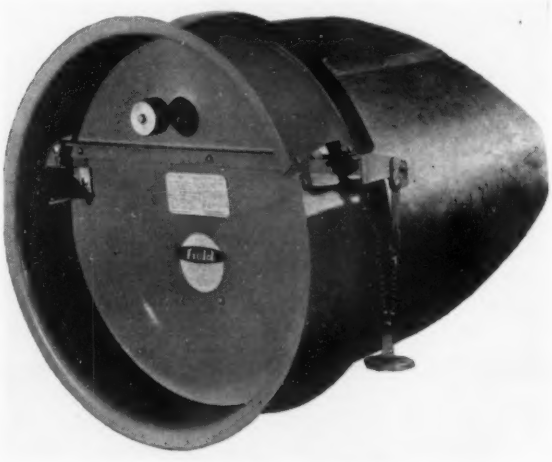
This new industrial unit uses the Perfection-Schwank Gas Infra-Red Heater to produce great flexibility in processing jobs. Such gas-fired, infra-red industrial processing equipment has surprising applications such as:

(1) Springs that take 30 minutes in a high-temperature oven can be normalized with infra-red energy on a conveyor belt in just 20 seconds.

(2) Water dry-off on phosphatized steel is accomplished in 48 seconds as opposed to 8 minutes.

(3) Boiler plate (⅝ in.) temperature rise of 200 degrees in 2 minutes.

Fannon will work with oven companies to incorporate this equipment in their units so that the order and fabrication are handled locally.



• *Field Control Division*

The Field M+MG2 is a precision, heavy-duty

This water heater heats water faster while it BUILDS LOAD

As the big blue flame sweeps the entire bottom of the tank, it burns hot and bright, produces thousands of Btus—supplies all the piping-hot water any family can use. This American-Standard water heater delivers hot water up to 25% faster than other water heaters of the same size.

To the homemaker, the big blue flame in all American-Standard gas water heaters means the luxury of almost unlimited hot water.

To the utilities, it is a good-will builder and a load builder at the same time. A good-will builder, because your customer gets plenty of hot water and pays less for each gallon used. A better load builder, because it heats water faster.

▶ Find out more about the complete line that includes de luxe and budget models in sizes from 20 to 65 gallons, with glass-lined or galvanized steel tanks. Call your American-Standard distributor, or write AMERICAN-STANDARD, PLUMBING AND HEATING DIV., 40 W. 40 St., New York 18, N. Y.

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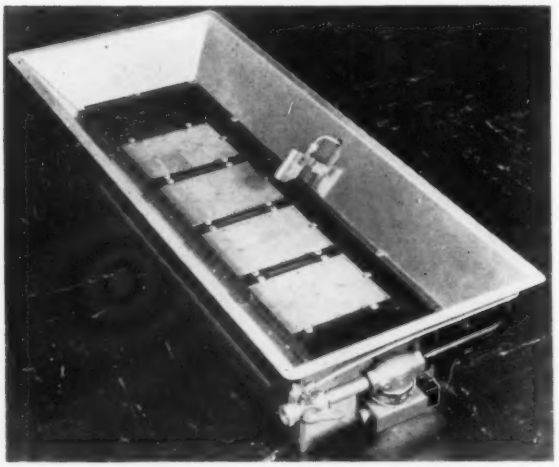
AMERICAN-Standard PRODUCTS

AMERICAN-Standard

PLUMBING AND HEATING DIVISION

barometric draft control, designed for use on all-fuel industrial furnaces and boilers. It offers improved efficiency with any fuel, especially during gas-firing, when it replaces the conventional draft hood.

And the M+MG2 offers these specific advantages over a draft hood: It permits a full range of firing rates to meet changing load requirements—from .002 in. to from .2 in. to .5 in., depending on size. It avoids the draft losses that occur during prolonged high fire periods with a draft hood. It also avoids the loss of prime that occurs during off-fire periods, and which results in fuel waste and spillage. The M+MG2 occupies only a fraction of the area required for a draft hood. It is ideally suited to gas-oil firing. It can be equipped with spillage-detecting switches if required by local codes. The M+MG2 is available in sizes from 10 through 32 in.



• *Perfection Industries*

Schwank infra-red generators were developed in Germany by Gunther Schwank, used extensively throughout Europe and manufactured in America by Perfection Industries, Division of Hupp Corp., Cleveland, Ohio.

Operation of these new infra-red generators on natural, manufactured or liquefied petroleum gas is extremely simple. This is a 100 per cent primary air burner requiring no pre-mix or blower. Key to the generator's efficiency is the surface combustion of an air-gas mixture and a ceramic mat that operates at a temperature of 1650 to 1700 degrees F. This temperature gives a high radiant efficiency (about 50 per cent) and high heat transfer rate. The wave length is in the band most readily absorbed by the object on which it falls.

The Perfection-designed Schwank generators are grouped in eight multiple ceramic mats called rayheads. The rayheads are assembled with aluminum reflectors, which help direct the infra-red wave lengths to the surface to be heated. The thermostatically controlled generators may be overhead or sidewall mounted.

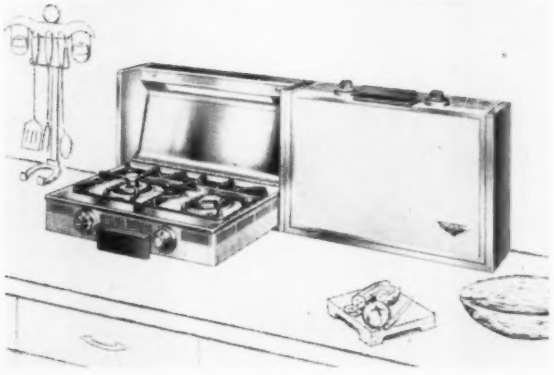
These units have been approved by the American Gas Association, Underwriters' Laboratories, and Board of Standards and Appeals, New York City.

They have proved to be popular heating units for all types of single-story commercial and industrial buildings. They heat the floor and equipment first regardless of the height at which they are mounted.

Perfection Schwank generators are solving many drying, processing and thawing problems in the metal, textile, chemical and food processing fields.

This new concept of burning gas opens up vast new markets for gas utilization.

RANGES



• *Dixie Products Inc.*

A new concept of cooking appliance installation and convenience is revealed to the gas industy through the Dixie Gas Foldaway. The unit is a "built-in" countertop cooking section with two gas burners that folds into its own slim, square-cornered cabinet when not in use. When folded away, the unit occupies less than 1 sq ft of counterspace.

Four gas burners can be put in less than 2 ft of counterspace. The counters are clear for kitchen work when the range sections are not in use. And there is no interference with drawer space since the unit is not recessed into the counter.

Foldaways may be used singly or in pairs in any number of convenient ways—side-by-side along the back of the counter, back-to-back on island counters, or with a free-standing range if additional burners are desired.

Other technical advancements designed into the units are thermostatically controlled top burners; automatic gas shut-off when the unit is folded away; continuously burning needle-point pilots; surface light that comes on automatically when the burners are lowered; convenience electrical outlet; and many others.

ANOTHER GREAT GAS RANGE FIRST FROM ROPER!

TOP-OF-RANGE ROTISSERIE, VERTICAL BROILER AND GRIDDLE

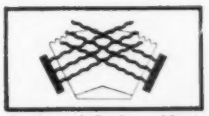
Revolutionary ROPER

Rotis-O-Grill

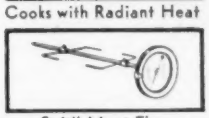
Pulls More Prospects — Makes More Sales

Here's 4-way cooking convenience never before offered! "Rotis-O-Grill" twin burners provide instant heat, penetrating radiant heat. Clean and spatter-free barbecuing, broiling or grilling. "Thermo-Spit" meat thermometer ends guesswork. "Rotis-O-Grill" adds welcome extra capacity to the cooking top, too . . . does more jobs at once. Make your selling easier, more profitable . . . sell "Rotis-O-Grill."

SEE ROPER at the A.G.A. CONVENTION BOOTHS 51 and 53



Cooks with Radiant Heat



"Thermo-Spit" Meat Thermometer

ROPER

"America's Finest GAS Range" . . . Now Finer than ever!

GEO. D. ROPER CORP., KANKAKEE, ILLINOIS

OTHER ROPER ADVANCES TO HELP YOU SELL: "Tem-Trol" Automatic Top Burner • "Circle-Simmer" Speed Top Burner • King-size 20" Oven • "Insta-Matic" Oven Guardian • "Insta-Lite" Automatic Lighting

• *Hardwick Stove Co.*

The MicroRay is a new broiler burner that produces a charcoal-like red glow at a temperature of 1600 degrees F. Infra-red energy at three micron wave length travels from the burner to brown and cook food with radiant heat.

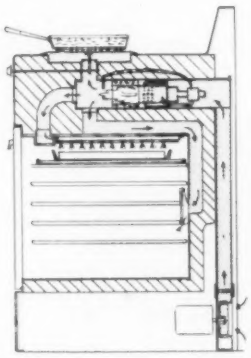
The radiant burner is made from high porosity clay, with over 5000 outlets, as compared with 101 ports in cast iron burners for conventional convection heating in broilers. The material's insulation quality permits holding the burner's inside temperature to 450 degrees F while the burning side temperature is 1600. This design means no flash-back at very low burner-head pressures generated and permits 100 per cent primary air firing.

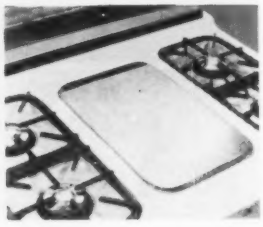
The broiler cavity and door are lined with aluminum. This reflects some 80 per cent of the radiant heat. The three micron wave length is excellent for cooking: hence, the MicroRay burner eliminates preheating (infra-red wave lengths behave like light to reach food immediately); cuts cooking time in half; cuts gas consumption for broiling in half; and outer walls, door handles and control knobs remain cool to the touch even during lengthy operation.

• *Jet-Heet Inc.*

This new range cooks with hot-air (though lower-than-flame temperature) stream impingement on food or utensils. The key is the relatively high velocity of the hot-air stream, and the basic principle involved is that of heat transfer coefficients increase almost linearly with velocity.

A motor-driven blower feeds air under pressure to a jet-type gas burner. Gas is burned with no primary air to give a low carbon dioxide component hot gas at about 1000 degrees F. The hot air is conducted through insulated ducts and shut-off valves to perforated surface units, a perforated broiler and to the oven. The utensils are supported about 0.25 to 0.50 in. above the perforated plate in position for the high velocity jets to impinge directly to give high heat transfer coefficients. Fully automatic controls vary the gas input over an extremely wide range in order to keep the outlet temperature constantly at 1000 degrees F.





• *Geo. D. Roper Corp.*

A new technical development has taken the "Rotis-O-Grill" out of the broiler compartment and put it on the top section of three new gas ranges designed by Geo. D. Roper Corp.

The unit can be used for conventional barbecuing, broiling, and grilling on top of the range and can be fitted for rotisserie cooking. Heat for all operations is provided by two radiant-type gas burners, each independently controlled. These new burners provide concentrated cooking heat without warming the kitchen.

The Rotis-O-Grill utilizes a sturdy spit with a built-in meat thermometer on the front end. This "Thermo-Spit" is designed to take the guesswork out of this type of modern cooking.

A thick, cast aluminum griddle replaces the rotisserie and broiler components for grilling.

This new feature is available on Roper's newly designed 36-in. Gourmet range, and on two other 36-in. models in the 1958 line.

Sensational *Yet-to-be-Announced* Gas Products

The finest residential heating, air conditioning and water heating equipment ever offered to the public!

As the nation's pioneer in automatic, gas-fired heating equipment, Bryant again leads the way in better products for the gas industry!

Smaller, more compact furnaces and boilers for residential applications . . . with new, simplified operation and controls. Better industrial boilers and unit heaters for commercial applications. New, fast-recovery water heaters . . . in styles and capacities for every requirement. Sensational, yet-to-be-announced new gas products that will put gas to work in more homes—doing more jobs —than ever dreamed of in the past!

Call or write Bryant for details of the new Bryant equipment for '59.

See why the *next* year can be the biggest year in the history of the gas industry!

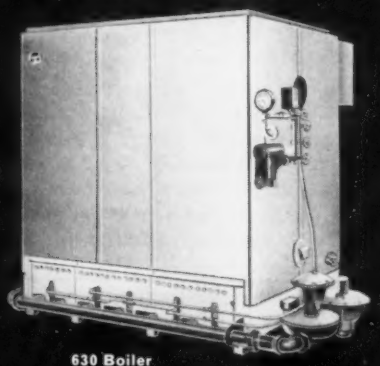
BRYANT MANUFACTURING COMPANY, INDIANAPOLIS, IND.
BRYANT MANUFACTURING, LTD., TORONTO, CANADA

bryant

AMERICA'S GREATEST NAME IN GAS-FIRED EQUIPMENT

389 Furnace

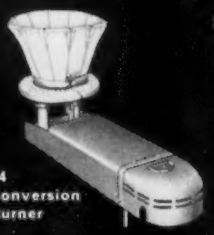
387 Furnace



630 Boiler

337 Unit Heater

26 Boiler



94 Conversion Burner

bryant

148 Hot Water Heater

• *Sunray Stove Co.*

Remote operation of gas ranges is given to the gas industry with Sunray's Touch of Tomorrow push button remote control range. The remote control is accomplished electronically with the range being controlled by a small control box from a remote point. With this feature, the homemaker can turn the top burners on or off from any room in the house or the front yard or patio. And three of the top burners have a bank of push button controls on the backguard of the range. Eight switches are provided for each of these three burners; seven are for specific heats. The fourth burner is a thermostatically controlled "Burner with a Memory" type.

The range is equipped with a clock control that can be used for timed cooking in the oven or on the thermostatically controlled top burner.

REFRIGERATORS

• *Norco, Inc.*

The new Norco 5965 gas refrigerator features modern slimline styling. The compact dimensions (44¼-in. high, 24-in. wide, 28-in. deep) and clean, squared-off design of this approximately 7 cu ft capacity unit make it ideal for built-in installations. A reversible left or right hand door adds to its versatility.

The silent high-capacity Norcold refrigerating unit has no moving parts and delivers an even cold throughout the box. A cross-top freezer compartment provides low-temperature storage while a full-width crisper at

(*Continued on page* 112)

LITTLE 20,000 BTU MODEL—

newest arrival to the Suburban Novent and Dynavent family of GAS heaters that install in WINDOW or outside wall (like an air conditioner) . . . needs no flue or chimney.

This little fellow is perfect for heating areas such as living rooms, bedrooms, playrooms, dens, greenhouses or wherever ventless heaters are undesirable and vented ones requiring a flue or chimney are impractical.

And just like his 35,000 and 45,000 BTU older brothers the new 20,000 BTU model has all of the Suburban Novent and Dynavent features—Power vented • Burns no room air • Takes no floor space • Fully automatic • Built-in or wall thermostat • Forced warm air circulation • Even temperature throughout.

SAVES UP TO 30% IN FUEL COSTS

SEE THE SUBURBAN DISPLAY AT THE "PARADE OF GAS PROGRESS" EXHIBIT, AMERICAN GAS ASSOCIATION CONVENTION, ATLANTIC CITY, OCTOBER 12-15

SUBURBAN APPLIANCE CO.

General Offices
Whippany, N. J.

Factory
Dayton, Tenn.

Only 14" Wide
Fits Between Wall Studs

NORGE To Unveil 3 Show-Stopping Gas Appliances!

A NEW GAS REFRIGERATOR

with automatic ice maker!

Offers the hottest demonstration tool on the street! Ice cubes are made, dispensed and stored... all automatically!

A NEW COMBINATION WASHER & DRYER

Revolutionary in design! Performance proven by 3 solid years of exhaustive field testing!

A NEW GAS RANGE WITH VERTICAL BROILER!

A real traffic-stopper! Uses exclusive infra-radiant ceramic burners to permit cooking meat on both sides at once! Seals in juices... cuts smoking ...reduces meat shrinkage!

SEE NORGE AT BOOTHS 59-61

"Parade of Gas Progress"
Atlantic City, N. J. • October 12-15

NORGE®

NORGE BW

Creative Engineering for Sales!

NORGE SALES CORPORATION, Subsidiary of Borg-Warner Corp., Merchandise Mart Plaza, Chicago 54, Ill. Canada: Addison's Ltd., Toronto. Export Sales, Borg-Warner International, Chicago 3, Ill.

Washington • *Cont'd.*

from p. 25

the disputed procedures, but requires that companies post bond to cover additional revenues in case the Supreme Court upholds the lower court.

An adverse ruling by the Supreme Court could cost pipelines an estimated $400 million in refunds for previous rate boosts. The liability of distribution firms to pass refunds along to customers is open to speculation now. One thing is certain, however: It would cause a lot of new bookkeeping and give work to more than a handful of accountants.

Meanwhile, it's too early yet to write off a new gas bill in 1959, congressional insiders say. Allowing for the usual campaign hysterics, the picture is believed to be only a little worse than this year by gas industry pundits in Washington. This might rule out passage of a bill similar to the Harris-O'Hara measure which made some progress this year, but not necessarily kill chances for some kind of milder measure.

Best guesses still tout either a measure setting guidelines for FPC administration of its not-so-new power over independent gas producers, or legislation to exempt thousands of small independent producers (those selling less than 2 MMcf in interstate commerce a year).

Rep. Oren Harris (D., Ark.), sponsor of the gas bill in the past two congresses, is still optimistic that a bill can be won that will give some relief to independent producers. But he is continually warning the industry, both privately and in public, that success will depend on how well the three segments of the industry resolve their different positions into a compromise proposal.

Fate of the present 27½ per cent depletion rate is also uncertain. Opponents in the final days of Congress this year made a strong showing in efforts to drastically cut it.

During debate on a massive measure containing technical changes to the nation's tax laws, opponents mustered 26 votes for a proposal to cut the depletion allowance for gas and oil to a flat 15 per cent (68 senators supported the present rate), and later raised their tally to 31 votes in support of a proposal to cut the rate on a graduated basis.

The disturbing facet of the vote on depletion is that would-be cutters are steadily gaining strength. On a similar vote in 1951, only 9 senators voted to cut the rate. In 1954, opposition was so slim that it failed to draw a recorded vote.

Some of the arguments opponents of depletion used—and will dredge up again next year—are being tossed around now in campaign speeches. One is that at the time the gas and oil depletion rate was set at 27½ per cent in 1926, the corporate tax rate was only about 15 per cent. Now, it is 52 per cent, the critics argue, and thus the same percentage depletion is a "windfall to the gas and oil barons."

The opponents are also making much of the history of the growth of the allowance—from 5 per cent

Lancaster Processing Makes Leather Soft, Supple, to Hold Oil Longer—Yet Keeps Leather Firm.
Extra Strong, Extra Rigid Grooved Metal Rims Hold Leather Firmly in Place.
"A Meter is only as Accurate as its Parts"
Endless metal Rings Draw Leather Evenly for Uniform Thickness and Pocket Depth.

Lancaster DIAPHRAGMS feature BUILT-IN QUALITY for STAND-OUT PERFORMANCE

Time-tested . . . meter proved . . . Lancaster Diaphragms are carefully built and precisely balanced.

Lancaster all-leather, and metal-rimmed diaphragms assure accuracy of Sprague, Ironclad, Tobey and tin gas meters.

For 1-A Sprague Gas Meters, Lancaster offers diaphragms complete with built-in adjustable carrier wire assembly that makes installation faster and easier!

Quality-built Lancaster Diaphragms are the Heart of Accuracy!

For Proper Meter Care Use These Lancaster Quality Products

Cork Gaskets
Diaphragm Oil
Dry Lubricant
Glass Grinding Blocks
Abrasive Paper
Index Stuffing Boxes Grease and Packing
Index Box Cement
Index Repair Bushings
Neoprene Connection Washers
Nylon Washers for Screws

Lancaster METER PARTS CO.
Manufacturers of Quality Parts for Gas Meters
POST OFFICE BOX 378 LANCASTER, OHIO
Canadian Representative: Ontor Limited, Toronto 2, Canada

in World War I to 12½ per cent, then 25 per cent and finally to the present rate.

And they contend that while the original depletion was limited to the recovery cost, and after this cost had been recovered the allowance was nullified, the cost can now be recovered "over and over again."

They also protest a provision of the present law called "discovery valuation," which permits the valuation for depletion purposes to be revised upward as the development of a well progresses.

* * *

CONGRESSIONAL anger at the U. S. Supreme Court over hosts of rulings in the past few years missed boiling over into new laws this year by only a whisker.

Legislation which would have curbed the Supreme Court's power to override state laws passed the House and was finally killed in the Senate in the closing hours of the session.

One effect of this bill would have been to overrule the Phillips natural gas case and restore state control over gas production and minimum prices.

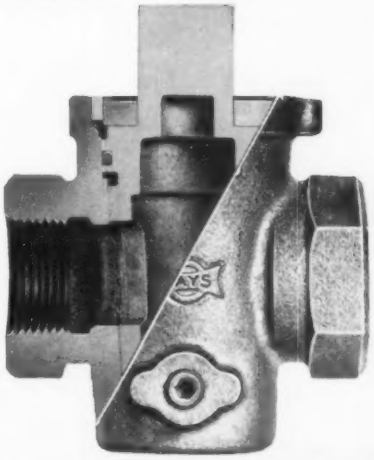
The proposal, a complicated legalistic slap at the Supreme Court through constitutional revision, is the outgrowth of resentment among various blocs in Congress over court rulings on issues such as school segregation, release of Communists convicted under state security laws, and interpretations of the federal government's power in such fields as labor, transportation, mining, and water power.

The House passed the bill, which was sponsored by Rep. Howard W. Smith (D., Va.), by a heavy 241-155 majority. As passed, it included the original Smith proposal limiting the Supreme Court's right to interpret federal laws when in conflict with state laws, and a provision specifically aimed at treason and sedition.

The measure drew support from an unusual coalition of conservative Republicans and Southern Democrats.

Backers of the measure admit the proposal this year got much more support than they originally thought it would. They have firm plans, they say, to press for passage again next year. ■

THIS GAS STOP WILL *NOT STICK...*

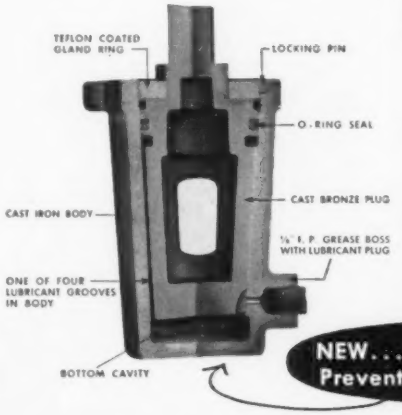


- A newly designed HAYS Lubricated and Tamper-Proof Gas Stop . . .
- Stop is completely lubricated at the factory . . .
- Four Grooves in body, and Lubricant Plug provide for pressure re-lubrication . . .
- Locking Pin positively prevents tampering at top of stop . . .
- O-Ring prevents top leakage . . .
- Teflon Coated Gland Ring reduces friction between top of plug and gland ring...

Re-Lubrication does the *TRICK*

HAYS

LUBRICATED TAMPER-PROOF SAFETY GAS STOP*



- Lower initial and turning torque . . .
- Extra grade gray iron body, gas service bronze plug . . .
- Individually tested . . .
- Black or Galvanized, Flat Head or Lockwing Pattern...
- Sizes: ¾", 1", 1¼", 1½", 2", for 125 psi. W. P.

Write for Folder 121 and prices.

*Patent applied for.

NEW... Solid Bottom Construction Prevents Leakage and Tampering

HAYS®

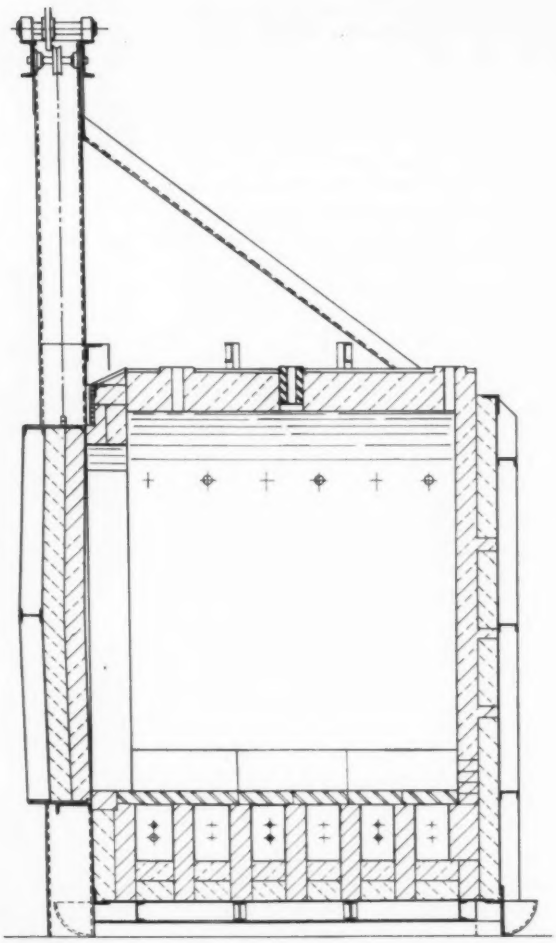
GAS SERVICE PRODUCTS

HAYS MANUFACTURING CO.

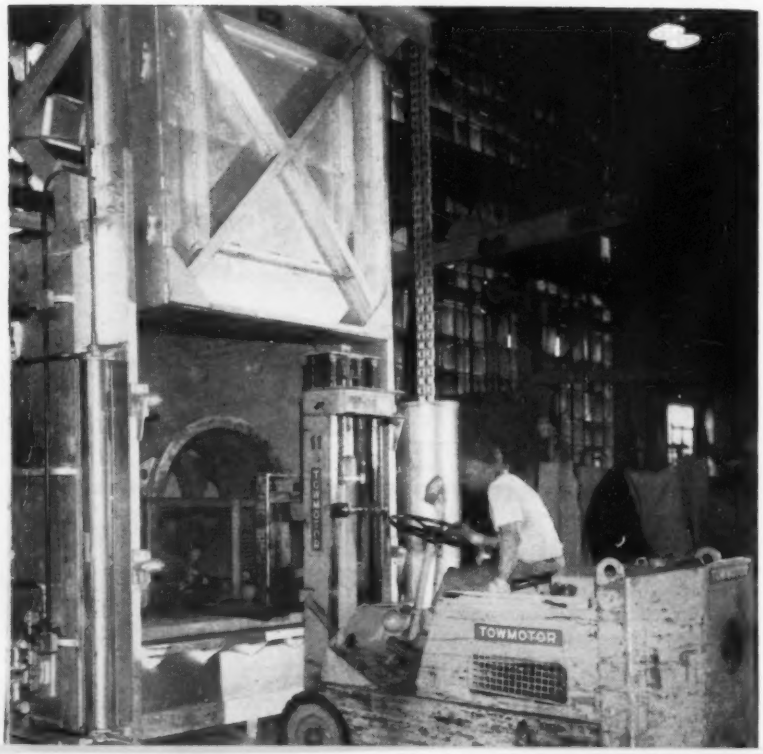
ERIE, PA.

Large oven furnace is versatile, automatic

By JERE N. HELFAT
Reliance Electric & Engineering Co., Cleveland



Schematic drawing shows how large oven furnace utilizes small floor space for large load it can treat.



Fork lift truck can bring its load right up to furnace door and deposit it well in the furnace.

A FLEXIBLE, ecomonical, and easy to operate oven-type furnace has added new versatility to heat treating operations at Reliance Electric & Engineering Co., Cleveland. Furnace size and design, Conjecto-Firing, and a cam-actuated program control system give this furnace a wide range of processes and temperature and the ability to handle both large and small parts with equal facility.

Reliance Electric, manufacturers of electric motors and con-

Continued on page 136

By RALPH SMITH

CENTRAL Electric & Gas Co., Lincoln, Neb., which goes to ingenious lengths for a happy customer relationship, counts as one of its achievements its budget plan of billing.

So far as the firm knows, it originated the idea whereby an annual gas bill is averaged out and a customer pays an equal amount each month of the year.

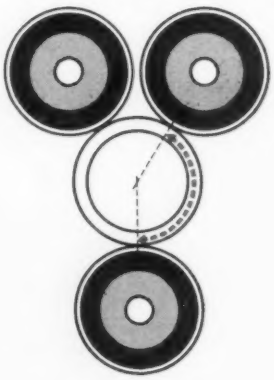
Not only was the firm the originator of the idea but it is unusual to the extent that it uses it. The plan is employed in all 65 communities of eastern Nebraska and eastern South Dakota served by the utility.

Central promotes its budget billing system to obtain new gas customers. Here advertising director Dick Sievers and two of his staff members look over new advertising material.

New extra-fast cutting RIDGID No. 315 Tubing Cutter

Capacity
⅜" to 1⅛"

3-Wheel Design
gives quick, clean cuts even in tightest places!



Compact and light, yet strong, this new No. 315 RIDGID 3-Wheel Tubing Cutter is extra handy on every job. Just what you need for that hard-to-get-at tubing. No skinned knuckles . . . no slow hack saw. Cuts copper, brass, aluminum, steel tubing and thin-wall conduit. Handy RIDGID fold-in reamer protects hands and pockets. Try the new RIDGID No. 315 and you'll wonder how you got along without it. Ask your Supply House today.

The Ridge Tool Company • Elyria, Ohio, U. S. A.

Furthermore, the firm is pushing the idea as permanent company policy with television, radio and newspaper advertising as well as with personal contacts. Approximately 10 per cent of the firm's 68,826 residential customers are on the budget plan. Adopted on a system-wide basis in 1954, the plan has multiplied 600 per cent since then. Indications are that the setup has accelerated to the take-off point and is now ready to soar.

"I wish we had everyone on it," said E. C. Deane, vice president and utilities division manager, who fathered the scheme.

The origin of the plan reflects both the lengths that Central will cheerfully go to and the wrinkles it will devise to get a customer and, once having gotten him, keep him.

The time was 1931. The place was Sioux Falls, S. D., where Mr. Deane was office manager. Times, tough everywhere, were especially hard in drouth-ridden South Dakota. Photographers for national magazines came to South Dakota when they wanted pictures of farmsteads with dust banked like snow drifts around buildings, gaunt cattle nibbling tumbleweeds for survival and farmers with faces seamed by anxiety. The dust bowl was bad everywhere in the plains states; South Dakota's was an extreme case.

In communities like Sioux Falls, conditions reflected the farmer's hardship. For Central this was translated into droves of customers who were unable to pay their bills.

To Mr. Deane, wrestling with the problem, the conventional step of cutting off service didn't make sense. It lost a customer. An extensive investment in mains, leads and meters lay idle. There was no positive inducement to clean up arrearages.

His solution was what Central refers to as its "blue meters." Mr. Deane collected a batch of quarter meters, painted them a distinctive blue, changed the 35-tooth sprocket for a 17-tooth gear and installed them in the homes of patrons behind in their bills. For every quarter deposited in the geared-up device, the patron was given 12½ cents credit on the old bill.

Continued on page 128

Engineer designs test panel to solve service problems

AN electrical test panel, designed by Howard Bray, laboratory engineer, has opened the door to a broadened and intensified appliance testing program at Washington (D. C.) Gas Light Co.'s utilization laboratory.

The panel is expected to fulfill a growing need imposed by the constantly increasing complexity of modern gas-burning equipment. With it, the company will be able to do a more comprehensive testing job on troublesome appliances than was heretofore possible. It is also developing improved servicing procedures; it adds a new tool for training servicemen in the laboratory; and will be used to settle the question of interchangeability of a number of components.

The panel is built on a 3 x 6-ft board of ½-in. sheet plywood, mounted on a 1 x 10-in. box frame and bolted to a standard work bench with a masonite top. It is divided into sections, with a d-c bank on the left and an a-c bank on the right. Three d-c voltmeters are lined up along the top row, left, and measure in the 0-1 v, 0-30 v, and 0-50 millivolt ranges. Below them are four d-c ammeters, measuring 0-50 microamps, 0-50 milliamps, 0-300 milliamps, and 0-1 amp.

There is a similar line-up of panelmeters on the right side: three voltmeters registering 0-10, 0-50, and 0-150 v and four ammeters measuring 0-1, 0-5, 0-15, and 0-30 amps.

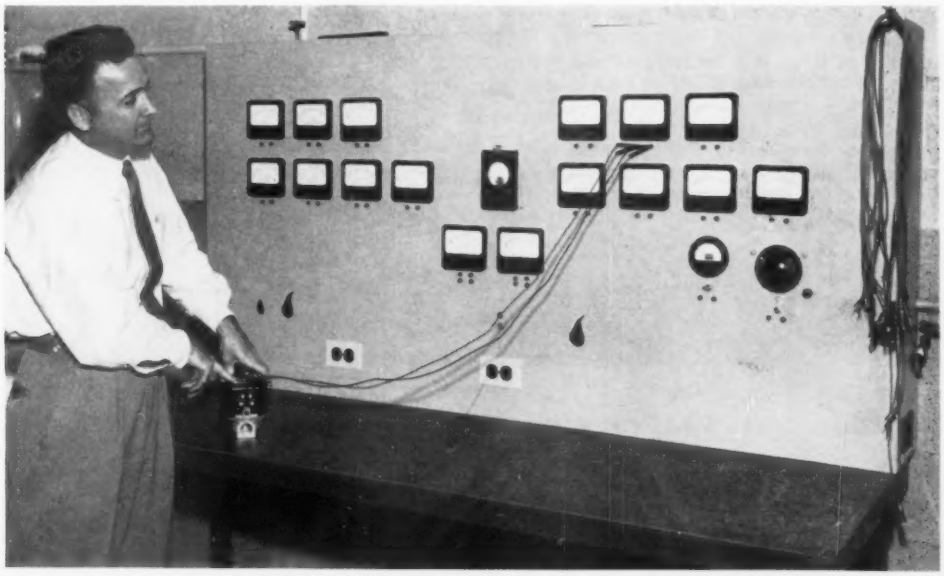
In the center, Bray clamped into place a portable ohmmeter, which can be easily and quickly removed for either testing use or replacement of batteries. In actual tests it is taken out and laid on the bench. Below this are two wattmeters, one in the 0-75 watt range and one in the 0-300 watt range.

Below the a-c ammeters, Bray mounted a time clock and variable transformer. The latter which is used primarily for determining maximum and minimum operational voltages on various components, has a 0-135 v a-c range.

The clock has a switch which enables it to be operated either manually, off the power line, or on load, through the equipment being tested.

Two electrical outlets are also built into the board, operated by a power switch which also provides current to run the variable transformer and the clock when it is on the line.

Gas is supplied to the board at 1 psig through two outlets. A regulator can be hooked up on each one to give whatever pressure reduction might be desired for testing pilots and small burners. An air line feeds in air at 150 psig.



Laboratory engineer Howard Bray is shown at the test panel he designed for Washington Gas Light Co.

Meter terminals are located beneath each meter.

Equipment that can be tested on the board with its present arrangement of meters include solenoids, motorized valves, heat motor valves, electronic relays, range clocks, fluorescent and oven lights, transformers, ignition coils, thermocouples and thermopiles, and electric thermostats or switches.

Among the jobs that have been assigned most frequently to the board are load tests and electric motors. Since the starting current on electric motors averages about three times the running current, it was necessary to design a switch which would shunt out the meter to prevent its being damaged by the overload. For this purpose, Bray fabricated a small portable switch which plugs into the meter terminals.

Since the advent of the board, the utilization lab was able to broaden the scope of its testing work. Previously, when portable meters were used, controls checkouts were relatively limited because of the lack of a sufficient variety of meters.

One of the most frequently used tests at present is that on millivolt valves. Another is the test on flue exhauster motors. Bray and his associates have also run a number of checks on interchangeability of parts, and they hope eventually to establish a set of standards for their servicemen. This is a problem that is frequently encountered in the field, where repairs are sometimes made using components that were different from those specified as original equipment. In many cases, such parts are interchangeable, but in many others they are not. It is the laboratory's job to determine which are and which aren't.

Another assignment which the board has been given is the checking of flashlight batteries, both the standard and re-chargeable types. A life test is being developed on the former.

The board is so constructed that several other metering devices can be installed at a later date. On the d-c side, an 0-500 millivolt meter will be added; on the a-c side, present plans call for a 0-3 amp ammeter. Variable resistors in three different ranges will be installed and scaled and a d-c power supply which will produce up to 5000 v will be incorporated.

One important job the new equipment will be called upon to perform frequently is dielectric tests on insulated bushings.

Tests are initiated both from field observation and from the laboratory itself. Trouble reports submitted by the serviceman to his foreman frequently start the testing machinery. If the difficulty is an isolated case, the equipment itself is brought into the lab for a checkout. If the trouble appears to be recurring in a number of appliances, indicating an inherent fault in design, a laboratory model of the device will be tested, and the difficulty reported to the manufacturer, sometimes with recommendations.

To date, test methods have not been standardized, but as the lab personnel gains more experience in the techniques made possible by the board, standard testing patterns will be set up. ■

use-proved perf-a-seal epoxy cuts costs of corrosion and leak control

...formulated specifically for gas needs

This actual-use photo shows how quickly and economically gas pipe leaks can be patched and corrosion can be controlled with PERF-A-SEAL, strongest sealant yet. Formulated specifically for gas needs, this reinforced, quick-curing epoxy compound is recommended by top firms because PERF-A-SEAL combines highest tensile, highest impact, highest burst-strength, maximum corrosion-resistance.

STRONGEST SEALANT YET

Supplier to America's Leading Gas Distribution Companies

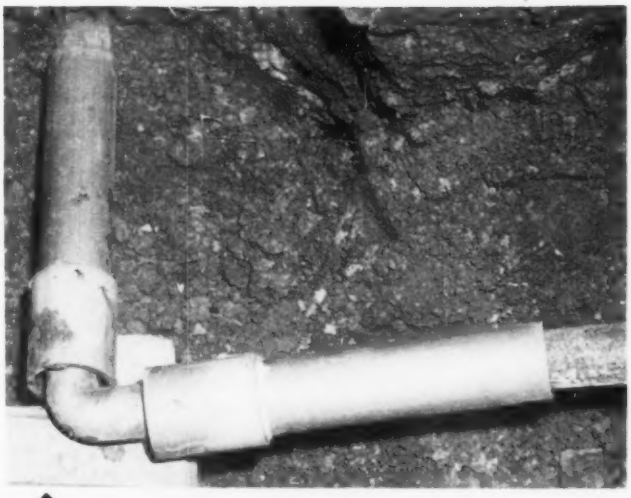
perfex plastics inc.
2632 S. DEARBORN ST., CHICAGO 16, ILL.

safe, sure renewal service with money-saving perfex materials

These photos show plastic pipe and other materials in actual installations of a major gas distribution company. All are products of Perfex Plastics, specialists with long experience in the low-pressure renewal service field. Each product is held to specifications, precision-engineered with close tolerances—your guarantee of safe, sure service. For example:

PIPE and COUPLINGS

Here a new section of 1.375 in. plastic pipe is being inserted into old 1.50 in. steel service. Perfex pipe is available in Tenite, Cycolac, P.V.C. or Kralastic. Inside couplings plus thinner and cement are also available for joining all four types of pipe.

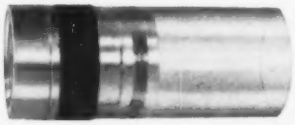


PROTECTOR SLEEVE

Designed for maximum protection at the main where plastic pipe is inserted into old metal service. Scientifically engineered to assure safe, sure, long-lasting renewal life.

HEAD ADAPTER

The strong link between metal and plastic service, patented by Perfex Plastics for economical, gas-tight headache-proof tie-in of the old and the new service. All parts of this head adapter are non-corrosive.

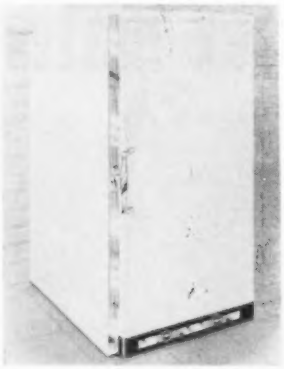


FOR DEPENDABLE, EXPERIENCED ONE-STOP SERVICE, LOOK TO

Supplier to America's Leading Gas Distribution Companies

perfex plastics inc.
2632 S. DEARBORN ST., CHICAGO 16, ILL.

(*Continued from page* 102)



the bottom keeps vegetables moist and fresh. An exclusive zip tube feature permits quick lighting from the front and automatic safety controls are of the latest design.

The new Norco will be available in decorator colors with bright chrome trim for both natural and LP-gas models.

WATER HEATERS

• *W. L. Jackson Manufacturing Co.*

The "Magic Mix" is a new stainless steel gas water heater, impingement-type burner, embodying many

advantages over the conventional Bunsen-type burner. The main improvements include elimination of air adjustments and the elimination of ignition and extinction noises inherent on most Bunsen-type burners.

The "Magic Mix" burner has a perfect air adjustment designed into it, so there is no chance of flues sooting due to improper field adjustments. Since there is no venturi or burner ports to be clogged with lint or cobwebs, no field service is required for this burner. With nothing to get out of adjustment, this burner contributes to improved efficiency for the life of the heater.

LARGEST STEEL GAS MAIN

Williams Brothers Company speeded up installation of the line with easy, economical Dresser® Couplings

Sure, the original specifications called for a number of Dresser Couplings, especially in the tough spots. But, the significant fact is that *after* further investigation of the expansion and contraction problem, the design was changed and Dresser Couplings were used where welded joints had originally been planned. Even with their welding equipment already in the field, Williams Brothers Co. found Dresser Couplings radically increased speed of installation.

You, too, will find Dresser Couplings the ideal joiner for your projected gas line . . . no matter what its size. Two man-minutes per bolt make every Dresser Coupling a permanent, gas-tight joint. And non-rigid Dresser Couplings absorb ground stresses and vibration, take up to 6° pipe deflection at each joint. Straight pipe takes long curves, goes over and around natural grade. Weather delays are cut to the minimum; when your men can get in the trench, they can make a joint that will last the life of the line . . . every time, with Dresser Couplings.

DRESSER MANUFACTURING DIVISION

ONE OF THE DRESSER INDUSTRIES

Bradford, Pennsylvania • Chicago • Houston
New York • Philadelphia • S. San Francisco • Toronto & Calgary

FROM WELL TO FLAME . . . A COUPLING OR FITTING FOR EVERY NEED

All-gas home is big hit in Greeley, Colo.

Almost 10 per cent of the 25,000 residents of Greeley, Colo., toured the city's first all-gas home during a recent weekend.

All of the gas appliances and equipment in the custom-built home were supplied and installed by Greeley Gas Co., sponsor of the event. According to Paul L. Good, vice president and general manager of the company, nearly six months of planning and cooperation with builder and gas equipment suppliers accounted in large measure for the success of the all-gas home project.

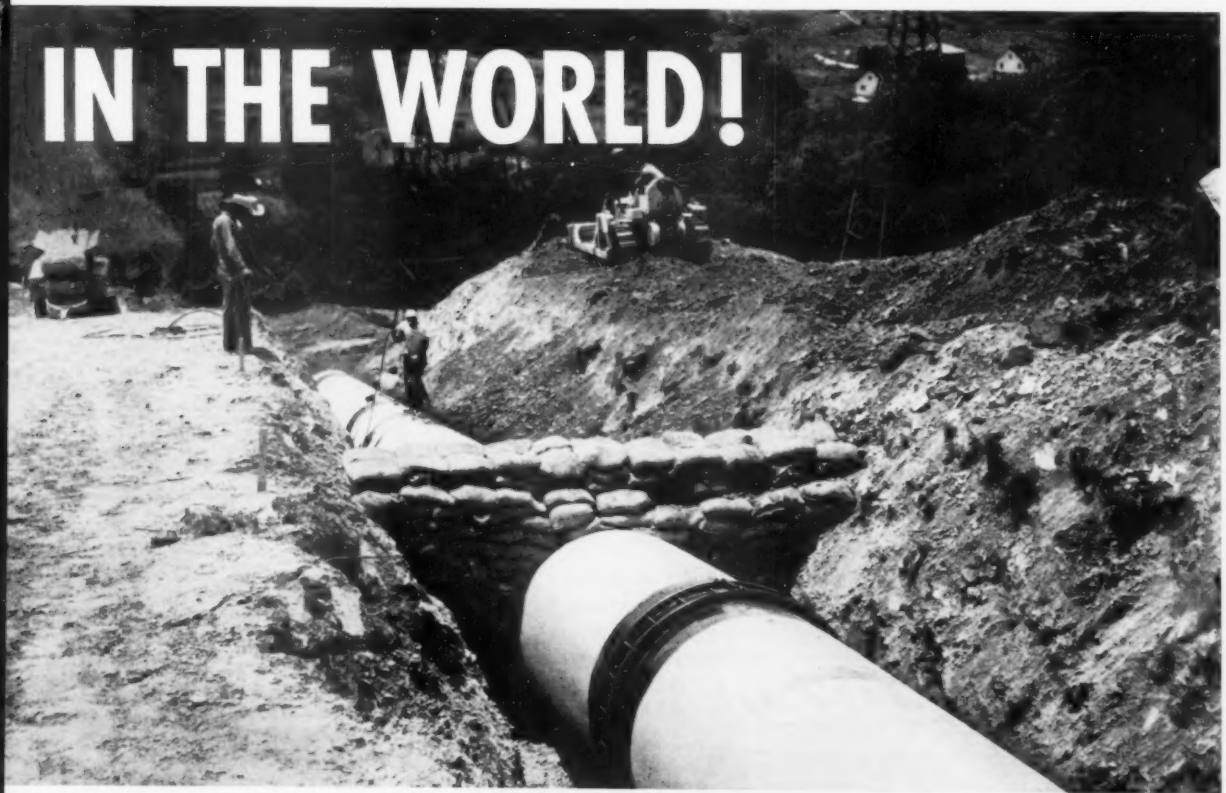
Local promotion included a series of 10 small-space teaser ads in the Greeley *Tribune* during a two-week period prior to the opening. On the day preceding the showing, a full-page black and white announcement invited the community to the home.

The 1500-sq ft all-gas home sponsored by Greeley Gas Co. attracted 2000 visitors over a recent weekend.

Registration slips entitled holders to a chance for a door prize—a gas yard light. Information requested on the registration form included age and condition of various gas appliances in the registrant's home.

"We consider this a highly successful promotion," said William Thomas, new business manager of Greeley Gas, "especially for a community of modest size."

Gas-burning appliances in the



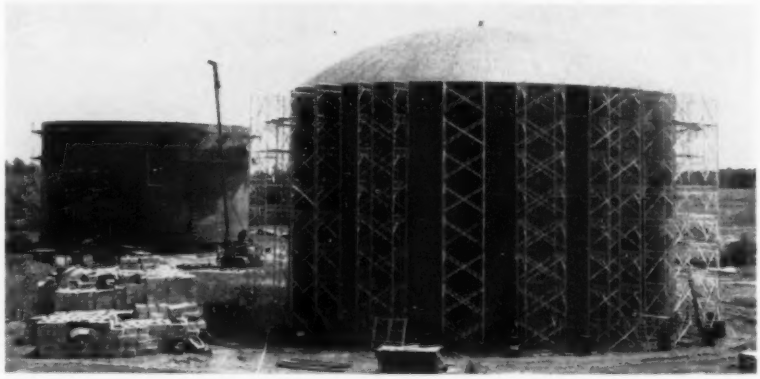
The 7½-mile Carnegie Natural Gas Co. twin line has a 54½-inch I.D.—a capacity of 255-million cubic feet of gas per day. The colossal gas line will service the Clairton, Irvin, Duquesne, National Tube, J. Edgar Thompson Works and Homestead Works of U.S. Steel Corp. in the Pittsburgh area.

SCHOOL FOR CHEFS—Food specialists from leading Ohio restaurants watch demonstration by Mrs. Kathryn Ashcraft (left), home service department field supervisor for Ohio Fuel Gas Co., and Miss LaVelle Wood, of the School of Home Economics at Ohio State, at the first of a series of Production Schools in Columbus. Gas equipment was used exclusively in demonstrations. The five-day event was sponsored by Ohio State Restaurant Association and Ohio State university. Thirty chefs learned at first hand the superiority of natural gas as a fuel in large volume cooking. Thomas Z. Dunn, manager of commercial sales for Ohio Fuel, helped with the arrangement.

home include a Bowser incinerator, Bryant automatic gas water heater, Arkla-Servel air conditioner, gas light in the front yard; and RCA Whirlpool built-in oven, surface range unit, Ice-Maker refrigerator, and combination washer-dryer.

Greeley Gas, a merchandising-minded utility, devotes about 50 per cent of its advertising expenditure to promoting general gas usage, offering service suggestions, and presenting institutional goodwill messages on worthy subjects.

Although not planned for immediate sale, the house was sold at the builder's price of $23,500 as a result of the weekend promotion. Several other builders have expressed considerable interest, and negotiations are already under way with prospects for two more similar all-gas homes.



Under construction near Atlanta are these two propane storage tanks, each to hold some 1.2 million gal. Propane is stored at minus 50 degrees. Tank in foreground has black glass insulation on sides. Next it will be covered with an aluminum sheeting like that on top.

To Sell Them on Gas
...Sell them
Siegler

Exclusive Features
- Patented inner heat tubes
- Patented built-in blower system

Exclusive Performance
- "Traveling" Floor Heat

and Your Profit Stays in Your Pocket

Your Siegler profits aren't lost in call-backs and complaints. Siegler quality sees to that, and makes every customer an enthusiastic salesman for you.

GAS Siegler HOME HEATERS
PATENTED AUTOMATIC
THE SIEGLER CORP. CENTRALIA, ILL.
THE HIGH PROFIT LINE

Atlanta pushing for completion of LPG job

Atlanta (Ga.) Gas Light Co.'s $1.7 million construction plan which will increase the company's liquid storage capacity by 75 per cent will be completed before the heating season begins.

Covered in the program:

- Two refrigerated storage tanks, each holding 1,291,000 gal., added to the one in operation at the Riverdale plant, south of Atlanta.
- Tripling storage capacity at Macon to 810,000 gal. Scheduled

for completion in September, this project also includes additional vaporizing equipment.

• In Augusta, $193,000 was spent on 10 more pressure storage tanks holding 27,000 gal. each.

• Storage capacity at Rome is being doubled to 216,000 gal. with installation of four pressure storage tanks, in addition to installation of an engine, compressor, and vaporizer.

Total storage after completion of current work will be 8,676,000 gal. of LPG.

Door-to-door appliance sales end in Milwaukee

The practice of house to house canvassing to promote gas appliance sales was ended last month by Milwaukee (Wis.) Gas Light Co.

The company will continue to sell gas appliances and will retain the force calling on commercial and industrial users, as well as the contact men with home builders.

In place of door-to-door canvassing, Milwaukee Gas will place new emphasis on working with appliance dealers.

Gas water heaters excepted from boiler code

Wisconsin's Industrial Commission has revised its boiler code, due in large part to the efforts of the Gas Appliance Manufacturers Association.

The new code recognizes American Standards for gas-fired water heaters and assures local acceptance of heaters approved by AGA. Previously, according to GAMA's Harold Massey, the state required certain water heaters of more than 100,000 Btu input to conform to the requirements of the Boiler and Pressure Vessel Code of the American Society of Mechanical Engineers.

Revision of the code followed hearings at which representatives of GAMA's water heater division pointed out that the ASME Boiler Code was not originally meant to cover today's usual automatic water heaters.

In fact, said Herbert Luoma, GAMA director of technical services, the ASME boiler and pressure vessel committee recognized this fact in May, 1958, when it approved a code revision to except

PARSONS introduces...

It's not much wider than a yardstick...

. . . only 3 feet-8 inches wide, to be exact! What's more, this new 77 is just 5 feet-8 inches "low" with the boom in digging position. It only weighs about 6500 lbs., for convenient trailer-transport from job to job.

Trench depths to 5 feet

Small in size, but big in capacity, Parsons 77 has a work range that will surprise you. It produces from 4.4 inches to 21 lineal feet of trench per minute, in 32 hi-lo digging speed selections. You get trench widths from 6 to 18 inches — *and maximum digging depth of 5 feet!*

The tiny 77 is heavy-duty in every respect. It has positive down-crowd on telescopic ladder boom. Self-cleaning, cast-steel buckets are equipped with Parsons "Tap-In" teeth. Shiftable spoil conveyor is instantly reversible for controlled discharge. Compact and maneuverable, the 77 turns within its own length — each crawler is independently driven, independently braked. Better check what this small utility Trenchliner can do on your service lines, small mains, footings, etc. Ask Parsons distributor for demonstration, or write to us for literature.

Here's a companion-model utility trencher on rubber tires — Parsons 88 Trenchmobile®. It makes self-powered moves over streets, highways, through traffic at 12.6 m.p.h. — digs 8 or 16 inches wide, at depths to 5 feet — Big ladder or wheel-types are also available.

Mail to: PARSONS Company, Newton, Iowa *for literature on new 77 Trenchliner*

NAME ..... TITLE .....

COMPANY ..... DIV. .....

STREET .....

CITY ..... STATE .....

☐ *Also send information on 88 Trenchmobile.* P812 GAS

PARSONS® TRENCHLINERS®
A DIVISION OF KOEHRING COMPANY

LOW BOY
radiant front

RVC SERIES
IN 7 SIZES
FROM 20,000 TO 65,000 B.T.U. INPUT

Peerless gas console heaters are available with counter flow blowers, automatically controlled, that give you warm floors in all parts of the home. These heaters are approved by the American Gas Association for use with natural, L. P., mixed, and manufactured gases.

Peerless **GAS CONSOLE HEATERS**
WITH **Counter Flow Heat** OPTIONAL

VC SERIES
IN 8 SIZES
FROM 14,000 TO 65,000 B.T.U. INPUT

The Counter Flow Blower attachment fits the 45,000 to 65,000 B.T.U. Heaters, either open or closed fronts. It is complete with its own temperature control. The boost given by this blower distributes heat to distant rooms and maintains an even temperature between floor and ceiling . . . lower Ceiling temperature means less heat loss. Can be had initially with heater or installed later.

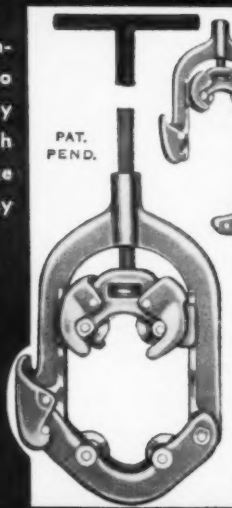
PEERLESS MANUFACTURING DIVISION
OF BOYER CORPORATION
LOUISVILLE 10, KENTUCKY

LOW BOY
closed front

GAS *Peerless* *The modern fuel* THE MODERN HEATER

IF YOU CUT LARGE DIAMETER PIPE . . .
YOU NEED THESE
New REED HINGED 4-WHEEL **PIPE CUTTERS**
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

REED MANUFACTURING COMPANY
ERIE, PENNSYLVANIA • U. S. A.

gas storage water heaters having an hourly input of 200,000 Btu or less.

Mr. Massey was confident that the action of the Wisconsin Industrial Commission and the ASME committee would serve as an example for several other states in which boiler code revisions or interpretations thereof are now under consideration.

Western Kentucky honors future home economists

Two recent high school graduates have received scholarships from Western Kentucky Gas Co., Owensboro. Martha Harlan of Glasgow and Anna Cunningham were named as recipients of the first annual Western Kentucky scholarships for study at Western Kentucky State College.

Miss Harlan's award is designated as a home economics scholarship and is to be used in the pursuit of a B. S. degree in home-ec. Miss Cunningham's award is to be used for teacher training.

N. C. Natural files financing plan with SEC

Financing is under way and North Carolina Natural Gas Corp.'s plan to supply natural gas to 31 communities in south-central and southern North Carolina is nearing fulfillment. The $22.1 million financing plan was filed with the SEC.

P. McDonald Biddison, president of the Fayetteville-based company, said the bulk of the outlay will come from private placement of first mortgage bonds in the amount of $13.7 million.

Covered by the plan is 635 miles of line and company distribution systems in 22 urban centers.

Main eastern artery will extend 195 miles from Mooresville to Wilmington. A major lateral line will run northeastward from Lumberton via Fayetteville and intermediate points to pipeline terminals in New Bern, Washington, and Rocky Mount.

The 22 towns where N. C. Natural will build distribution networks are Aberdeen, Albemarle, Benson, Clinton, Dunn, Erwin, Farmville, Goldsboro, Hamlet, Laurinburg, Lillington, Lumberton,

Norwood, Raeford, Red Springs, Rockingham, Roseboro, Salemburg, Southern Pines, St. Pauls, Tarboro and Wadesboro.

In addition, N. C. Natural has wholesale service agreements with four municipalities (Rocky Mount, Wilson, Monroe, and Greenville) which will sell gas through city-owned systems.

Also, the company has a similar agreement with Tidewater Natural Gas Co. Tidewater will buy gas at wholesale for distribution to residential and commercial customers in Wilmington, Fayetteville, Kinston, New Bern and Washington.

Early operation seen for ALG's chemical subsidiary

Arkansas Louisiana Chemical Corp., subsidiary of Arkansas Louisiana Gas Co., will begin operation of its facilities in Pine Bluff, Ark., on the first of November. The plant will produce chlorine and caustic soda for industrial uses in the mid-south.

W. R. Stephens, president of the chemical company and its parent, pointed out that the plant is a significant development in ALG's diversification program.

MFS expands system

Mountain Fuel Supply Co., Salt Lake City, has called for construction bids on new gas distribution systems in Providence and Wellsville in Cache county.

MFS vice president J. W. Allen reports that a canvass of the two towns indicated 265 potential customers in Providence and 300 in Wellsville. Earlier this year, MFG obtained franchises in River Heights in Cache county, and Willard in Box Elder county. Customer meters are being set in the latter towns.

Lea County Gas expands

Southwestern Public Service Co., Amarillo, and Lea County Gas Co., El Paso, have entered into a tentative agreement under which Southwestern will sell most of its gas and water utility properties to Lea County. Selling price: $5 million in cash.

Approval must be obtained from the public service commissions in the states involved and the FPC. Involved are gas systems in 20 communities in New Mexico, Texas

Clean walls and smooth floors, without any hand trimming, are signs of a trench dug by the powerful H-5 Hydrohoe-Hydroshovel.

To give you a money-savin' edge...

HERE'S BIG PRODUCTION DIGGING— NEW H-5 HYDROHOE-HYDROSHOVEL-HYDROCRANE

This new H-5 Hydrohoe-Hydroshovel's wrist action generates up to 20,000 pounds of force at even its deepest digging depth — 18 feet. Combine this powerful wrist action with boom crowd-down and digging ram forces and you have OVER 90 TONS of ram force — more than enough to break through tough materials such as coral and frozen ground.

Then, for fast digging, selector valves and the new differential valve put *several speed and force ranges* at your fingertip command. In gas line trenches and mains — or valve and anode pits — you get big production digging.

And the Hydrohoe-Hydroshovel can be converted to crane front end for lifting work. Your Bucyrus-Erie distributor wants to demonstrate *all* the digging advantages of the ½-yd. H-5 Hydrohoe-Hydroshovel . . . and the tricky digging abilities of the smaller ⅜-yd. H-3 Hydrohoe-Hydroshovel. 276H58

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WIS.

Over 50% of Hydrocranes sold last year were repeat sales.

I'd like complete details on the new H-5 Hydrohoe-Hydroshovel.

Name _____

Company _____

Address _____

City _____

State _____

276H58

and Oklahoma. The largest systems are Roswell in New Mexico and Borger in Texas.

Gas program scheduled at national safety meet

The public utilities section of the National Safety Council is planning a comprehensive program for the National Safety Congress, Oct. 20-24 in Chicago.

Mrs. Elsie Alcorn (center), home service director of Milwaukee (Wis.) Gas Light Co., receives $250 award for coaching "Mrs. Wisconsin" prior to participating in the recent Mrs. America national finals. Mrs. Wisconsin won the thermostatically controlled top burner cooking competition. Mrs. Shirley Pemberton of Robertshaw-Fulton Controls Co. is making the presentation. Bruce McCandless vice president in charge of sales for Milwaukee Gas, looks on. Robertshaw sponsored the top burner event.

For the gas industry group, according to J. G. Lambert, safety supervisor of Northern Illinois Gas Co., Wheaton, the program will tell how to do it and show how active support of the "National Program of Safety Through Informed Supervision" is getting excellent results.

R. N. Papich, AGA safety consultant, will talk on "Gas Industry Safety Program — Paying Off." Other speakers are S. M. Foeller, superintendent of transportation, Michigan Consolidated Gas Co., presenting "The Third E of Accident Prevention Enforcement"; and M. B. Travis, safety engineer for Northern Natural Gas Co., who will show why "Safety Is Part of and Not Apart from Operations."

Laclede aids concert revival in St. Louis

Laclede Gas Co. has been credited with reviving outdoor band concerts in St. Louis parks.

Laclede's board chairman, Robert W. Otto, stepped in when St. Louis Mayor Tucker was looking for a way to put on the free band concerts.

As co-sponsor of the civic project, Laclede backed at least six of the shows. More than 8000 attended the opening program.

More than

2 MILLION FEET OF ½ INCH KRALOY SERVICE PIPE

already installed

Since 1945 more than two million feet of one-half inch Kraloy Plastic Pipe has been installed for natural gas service lines. This one-half inch PVC pipe has done a job superior to that of ¾ inch, and larger pipe, when made of other materials.

One-half inch Kraloy PVC Pipe can also supply more than an adequate volume of natural gas to your customers. Kraloy can do this because of its mirror-smooth interior walls which result in an extremely high C factor.

Other Kraloy advantages:

1. Kraloy is permanent—not subject to electrolysis, rot, rust or scale.
2. Kraloy's flexible strength allows it to be installed faster and easier.
3. Kraloy's lighter weight lets your trucks carry more pipe footage.
4. Kraloy delivers cleaner gas—reducing foreign deposits in jets, valves, etc.

WHEN YOU SPECIFY YOUR NEXT INSTALLATION, DO AS OTHER LEADING GAS COMPANIES DO...SPECIFY KRALOY PVC PLASTIC PIPE!

Representatives:
Steele & Associates—Atlanta, Georgia
The Mack Company—Houston, Texas
H. J. Hodes—Kansas City, Mo.
The Crane Co.—Los Angeles & Denver

Call, write or wire for detailed information and specifications.

KRALOY *plastic pipe co., inc.*
4720 East Washington Boulevard, Los Angeles, California
Subsidiary of the Seamless Rubber Co., a Rexall Drug Co. Subsidiary

New energy source heads for AGA convention

The gas-fired power burner, a dramatic new source of energy, will be used in the new RCA Whirlpool Miracle Gas kitchen when it is unveiled this month during the AGA's Parade of Progress.

The power burner, through the combustion of gas, creates the energy for various kitchen functions and also provides for heating, cooling, and purifying the air throughout the entire house. The unit, which is housed in an ordinary kitchen base cabinet, provides energy for preservation and the cooking of foods.

Whirlpool engineers point out that their work with the new power burner has convinced them that efficiencies not even dreamed of previously will soon be a reality.

While the Miracle Gas Kitchen includes many principles and products not yet available, Whirlpool engineers emphasize that such developments are feasible and offer great promise for future incorporation into a marketable kitchen. Development of the present Miracle Gas Kitchen involves an outlay of a quarter of a million dollars by Whirlpool.

AGA publishes new edition of "Gas Facts" for 1958

The 1958 editions of AGA's "Gas Facts" and the "Gas Data Book" are now available.

"Gas Facts," the annual statistical year book, presents comprehensive information on all phases of gas industry operations during 1957 and earlier years. Some of the subjects include energy reserves, natural gas production, natural gas exploratory and developmental drilling, manufactured gas production, transmission and distribution, development of underground storage facilities, customers, sales and revenues of the industry, gas appliance shipments, sales of gas to large industrial users. Also, new security issues of the industry, financial results of different categories of gas companies, industry income statements, etc. The publication is available at a cost of $3 per copy for the first five copies and $1.50 per copy thereafter.

The "Gas Data Book" is a pocket summary of the most salient statistics regarding the operations of the industry for convenient reference.

"For tight spots and tough roots... nothing beats our Buckeye 403's!"

— says J. W. Cain, Sarnia, Ontario

Seventy-eight miles of service line and connections will soon bring natural gas to hundreds of thousands of Ontario residents. Handling the ditching is Contractor J. W. "Jim" Cain, a newcomer to Canada's booming pipeline industry.

"Our biggest obstacle is the hundreds of hardwood trees that line every residential street," says Mr. Cain. "That's why we've standardized on the Buckeye 403. It's the only machine I know that can maneuver quickly . . . yet has plenty of power to knife through thick roots. We own five Buckeye 403's. They've practically eliminated time-consuming stops where a hatchet or a shovel previously had to be used."

See for yourself! Your Gar Wood-Buckeye dealer demonstrates the 403 Utility Ditcher. Call him soon or write to: Customer Service Dept., Gar Wood Industries, Inc., Wayne, Michigan.

Gar Wood Excavators

Gar Wood Winches

Gar Wood–St. Paul Hoists & Bodies

Gar Wood INDUSTRIES, INC.

Findlay, Ohio • Wayne, Michigan

STOP H_2S CORROSION BEFORE IT STARTS!

The Connelly IRON SPONGE purification process at the well site removes hydrogen sulphide BEFORE the gas is piped to central processing. Thus, the cause of pipe line corrosion is eliminated because corrosive gas never enters the transmission lines. Additionally, Connelly IRON SPONGE eliminates the need for extreme close control. It operates with high efficiency at low or high pressures—absorbs more H_2S, gives longer service between foulings and is easily regenerated. If you have a purification problem check this MOST ECONOMICAL solution today. Write for Field Processing Bulletin #OG-7.

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Elizabeth, New Jersey

Markets growing for heavy-duty gas heaters

Gas-fired heavy-duty forced air heaters are one of the fastest growing branches of the heating industry, according to GAMA. Accounting for this is a wide array of favorable factors—particularly industry's increasingly close attention to heating and ventilating problems.

In establishing a new division this year for heavy-duty forced air, GAMA defined such equipment as direct-fired heaters, or heat diffusers, with capacity in excess of 500,000 Btu per hr output. They are used for comfort heating and sometimes for other purposes, too, in buildings having a wide expanse of open space or where rapid air changes are likely to occur.

Heaters in this category using gas, or gas in combination with oil, probably will account for a 1958 production total aggregating well over 3 billion Btu output, according to GAMA. This total about doubles that of two or three years ago. A number of the members have voiced the view that it may double again in a similar period.

This increase is in addition to the growing demand for heaters similar in a number of ways to the heavy-duty equipment but made in smaller capacities, mostly 200,000 to 500,000 Btu. Often heavy-duty equipment is installed in conjunction with smaller heaters. In vast plants covering a number of acres, heavy-duty gas heaters of up to 2 million Btu capacity may be used in combinations aggregating tens of millions in capacity. In a huge western steel plant the total for such gas-fired equipment exceeds 70 million Btu.

Generally, however, other influences are reported more than offsetting this decline in new plant and equipment. Industries are pushing heating and ventilation modernization in their quest for employee efficiency and satisfaction and for operating economy.

Increased supplies of natural gas and LPG are becoming available at a time when various processing changes—as well as the spur for economy and efficiency—are prompting heating system changeovers.

Moreover, many factors have combined to intensify industry's

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

GREENLEE

GREENLEE TOOL CO.

1950 Columbia Avenue • Rockford, Illinois

demand for one-story buildings with large, unobstructed floor areas. New forges, presses and other types of equipment, much of it automated, must be accommodated. The industrial lift truck and other equipment for materials handling has changed aspects of manufacturing and warehousing.

Important economies are claimed from the standpoints of equipment and fuel costs, maintenance and supervision. Because heat can be directed where needed, without putting personnel in line with a direct stream of warm air, it is possible to heat part of a relatively large building, leaving other parts unheated.

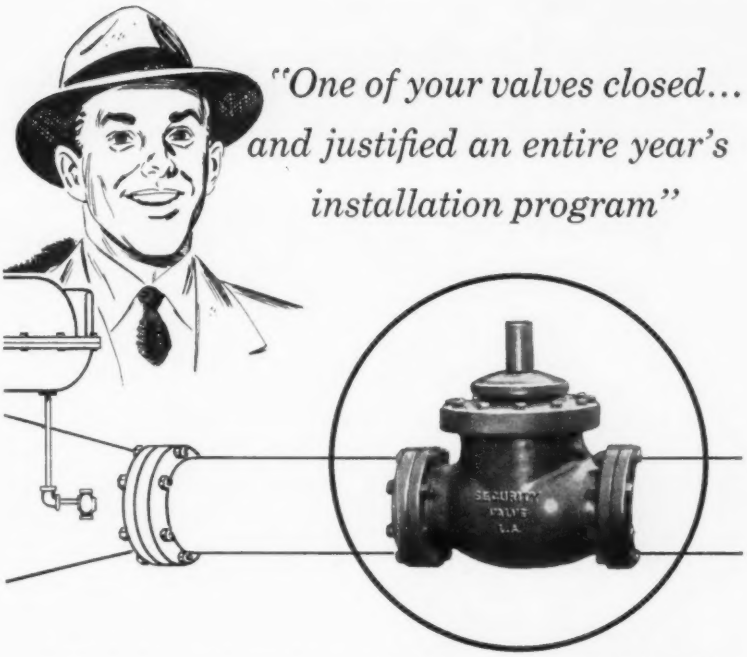
The most common installations are without ducts, with the heaters lining the walls of the building and sending a high velocity stream of heated air into working zones in a line parallel with the floor and from a height about 10 ft above it. Thus the stream is over the workers' heads. Air is drawn back to the base of the heater at velocities low enough to avoid drafts.

Many experiences and records are cited to show this method produces less stratification or "packing" at roof level—and hence less heat loss there—than certain others.

The floor-positioned, ductless arrangement may be the most common but is by no means exclusive. Newest summaries of installations show an almost endless combination of arrangements, ranging from the simple duct carrying heated air to a small office to the complex heat distribution arrangements for schools, libraries, and exposition halls. When space or other considerations dictate, some of the heavy-duty heaters may be installed suspended, in either horizontal or inverted position.

The heaters may distribute 100 per cent outside air, recirculated inside air, or any combination of the two. Division members report increasing emphasis on air tempering operations, in which large quantities of heated air are supplied to replace that used to carry off dust or fumes. The heaters, sometimes in conjunction with other corrective measures, are figuring in plans that not only remove contaminants more completely and effectively but do so without the cold air drafts previously suffered.

(*Continued on page* 139)



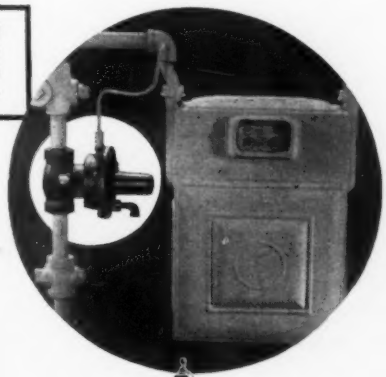
"One of your valves closed... and justified an entire year's installation program"

■ That's the experience of just one of the major gas companies and gas-using industries from coast to coast who have standardized on Security Automatic Shut-Off Valves. Because of their *absolute* protection against overpressuring, the operation of a single Security Valve can pay for a system-wide installation.

Security Valves are positive and always dependable . . . they are engineered for one specific function. Vital in congested areas, they eliminate both the expense and hazard created by high-capacity vent lines necessary when other over-pressure protection devices are employed.

A *complete* line, Security Automatic Shut-Off Valves are available in sizes ¾" to 12" for use on lines operating on inches water column to 1500 psig. They can be installed up or downstream of the regulator and controlled directly or by means of a pilot line.

Security Automatic Shut-Off Valves range from ¾" for domestic lines (right) to large distribution line sizes (above).



Nationwide representation insures fast help on your gas safety problems. Write today for the complete story and specifications of Security Valves.

SECURITY VALVE

SECURITY VALVE CORP.

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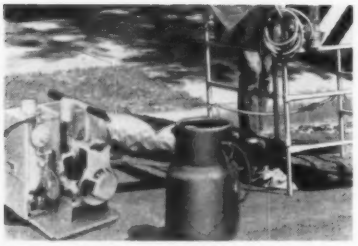
GAS DIGEST

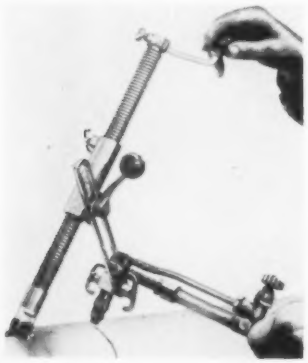
New Products and Trade Literature

For more data on any of these items use the Readers' Service Card on pages 125, 126



1. Manhole ventilation

Morrison-Pelsue Co.'s ventilating heater is being used to clear manholes of gas. The 62-lb portable unit is equipped with a propane-operated Briggs & Stratton engine. As a ventilator, it produces 300 to 800 cu ft of fresh air per minute. It is equipped with 15 ft of 6- or 8-in. flexible duct.
Morrison-Pelsue Co.

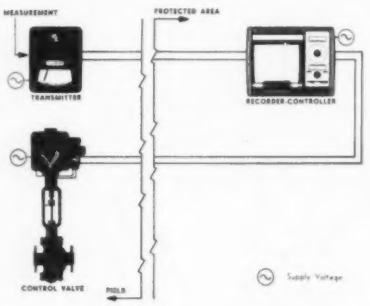


2. Hole cutter

Six models designed to cut various shaped holes and end protrusions now are available in a new line of VUS flame-cutting devices. Holes from $2\frac{3}{4}$ to 24 in. in diameter can be handled. Cuts possible include straight end, circular holes in cylindrical curved surfaces, vertical or inclined straight cuts, and a variety of others.
Orbit Sales Co. Inc.

3. Tractor-shovel

Frank G. Hough Co.'s new four-wheel-drive, rubber-tired tractor shovel has a 7000-lb carry capacity. Model H-70 loader replaces Model HH Payloader. Features of the new H-70 include more power, more traction, stronger components, greater protection against dirt and dust, and more efficient torque-converter.
Frank G. Hough Co.

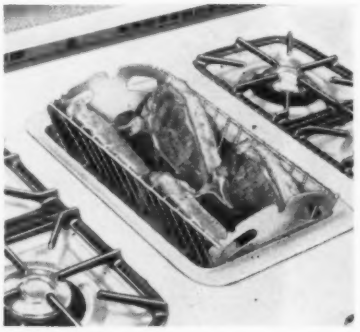


4. Control line

Foxboro is introducing a full series of completely solid state electronic control instruments. Called Electronic Consotrol instrumentation, the new line consists of advanced design transmitters, recorders, controllers, and valve operators. Every function in the process control loop is covered.
Foxboro Co.

5. Compression couplings

Joslyn has designed its new electrically conductive compression coupling to provide a low-resistance electrical joint essential to cathodic protection systems. In addition to all the features of Joslyn's standard compression coupling, the new units assure a sealed-in bond when the compression nuts are tightened.
Joslyn Mfg. & Supply Co.

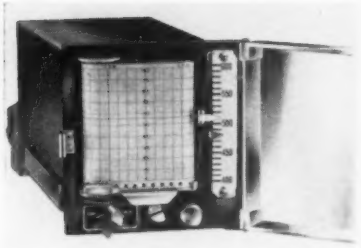


6. Vertical broiling

Vertical broiling is offered by the Rotis-O-Grill, featured in several 1958 Roper ranges. Located conveniently up on the range top, the Rotis-O-Grill holds food in a near-vertical position for broiling. Fats and greases drain off quickly before they can flare or spatter.
Geo. D. Roper Corp.

7. Pocket receiver

Motorola has introduced its new Handie-Talkie pocket receiver and accompanying Handie-Talkie pocket transmitter. The fully transistorized receiver picks up all radio signals on a system's frequency. Communications can be maintained with the system's base station or any of its mobile stations.
Motorola Inc.

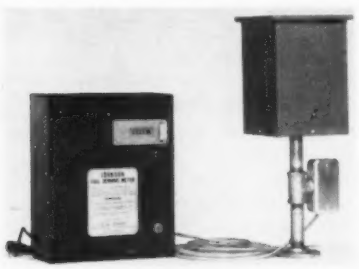


8. Control stations

Two new control stations from Bristol are of the Metagraphic type. They are for use with process computer systems. One receives a 3-15 psi pneumatic signal from the computer that is the value at which the measured variable is continuously recorded and indicated. The other station receives from the computer a 3-15 psi pneumatic signal of the valve pressure which should be maintained to provide optimum yield.
Bristol Co.

9. 6-in. plastic fittings

Tube Turns is offering a complete line of injection-molded unplasticized polyvinyl chloride fittings and flanges for large size (6 in.) UPVC piping. Ninety- and 45-degree elbows, tees, reducing bushings, threaded and socket companion flanges, and blind flanges are available.
Tube Turns Plastics

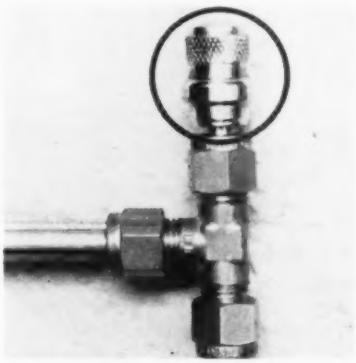


10. Degree-day device

The combined effect of temperature, wind, and sun is measured with a new degree day device. The Johnson fuel-demand meter registers total accumulated effective degree days. A weather-sensitive element fastened to the roof and exposed to the weather connects by electrical cable to an inside unit located on wall or desk.
Johnson Degree Day Systems

11. All-steel cover

Practical uses for an all-steel cover include open side covering for packaged compressors, field pump and gathering stations, and drilling rig accessories. The movable unit can be assembled in 2½ hr by the field crew. Made of galvanized corrugated steel sheets erected on 3-in. tubular columns, the cover is 10 ft wide and 20 ft long. Tubular columns can be supplied 10 ft high.
National Steel Products Co.

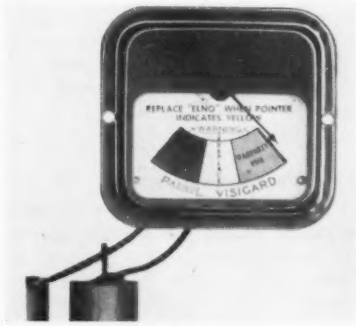


12. Purge valves

Gases or liquids can be bled from instrument and process lines with Nuclear Products new Nupro purge valves. Made in a variety of materials, these valves have features that insure maximum operation under all conditions, including highly corrosive applications.
Nuclear Products Co.

13. Instrument layout

Bristol is offering ¼-scale photoprints of its instrument line to engineers, designers, etc. A survey of layout practice showed 1:4 to be the scale most commonly used. The new cut-out and paste-on technique makes a clear, accurate picture of a proposed control panel easily available during early planning stages.
Bristol Co.



14. Water heater guard

A Visigard system from Cleveland Heater is said to completely eliminate disassembly of water heater tanks for visual inspection of anodic rods. The system is standard equipment on Cleveland's line of large volume Rex booster water heaters. The Visigard system is located on the water heater jacket. An easy-to-read meter gives instantaneous evaluation of the anode's protectiveness.
Cleveland Heater Co.

15. Carbonated water

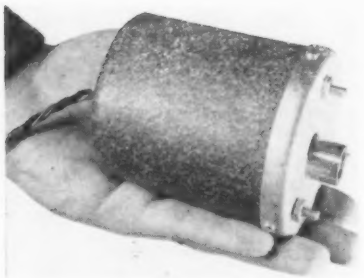
Carbonated water can be produced domestically or commercially with a newly patented device. The apparatus uses the products of combustion to derive the CO^2 gas. The water is piped in the same as the gas refrigerator pipes in the water for ice cubes. The mixture of gas and water produces seltzer. According to the inventor, natural gas is conducive to the project. The process is automatic and endless as long as water and gas are available.
Meyer Epstein

16. Hand stroboscope

This instrument can be used for timing fly wheels and balance wheels, or for timing any constant speed, continuous cycle motion. The hand stroboscope enables the user to obtain instantaneous views of objects in rapid motion, and quantitative data on objects which carry out a regularly repeating pattern of motion.
Edmund Scientific Co.

17. Transistorized radio

Completely transistorized receiver and power supply and a partially transistorized transmitter are featured in Motorola's new MOTRAC radiophone. More than 20 transistors are used. The entire unit is but 3 in. high, 11 in. wide, and 17 in. long. A primary advantage of the MOTRAC unit and its extensive transistorization is its low power consumption characteristics.
Motorola Inc.

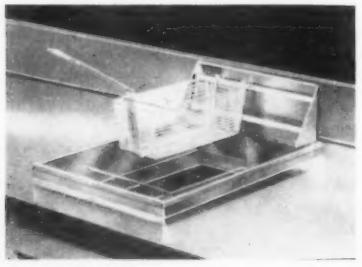


18. Shaft-mount gear motor

The SM-5 Shaftrol is a new high torque, shaft-mounted, control gear motor. It has a hollow output shaft and mounts directly on the driven shaft. Available with or without a built-in potentiometer, the gear motor can provide remote or automatic control of valves, variable speed drives, variable displacement pumps, etc.
Jordan Co.

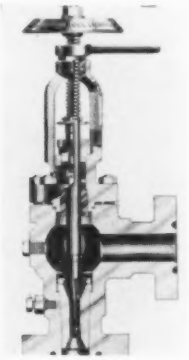
19. Portable drawing board

Molded of high impact polystyrene, this portable, precision drawing board weighs just 7½ ounces. It comes complete with two transparent plastic triangles (one each 30/60 and 45). Two retractable metal straight edges eliminate the need for a T-square. Four recessed spring clips hold standard 8½x11-in. sheet of paper.
Leslie Creations



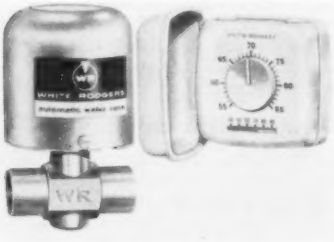
20. Built-in gas fryers

Frymaster's new built-in deep fat frying units provide unlimited design flexibility. They can be located anywhere along the counter, enabling the fabricator to create a complete service-center for the chef with every needed item placed in a natural work flow arrangement.
Frymaster Corp.



21. Metering valve

A new large, high-pressure throttling valve for general industrial use is announced by Shaffer. The metering valve's features make it suitable for accurate gas or fluid control. Outside threads give corrosion resistance. The stem may be located at any setting.
Shaffer Tool Works

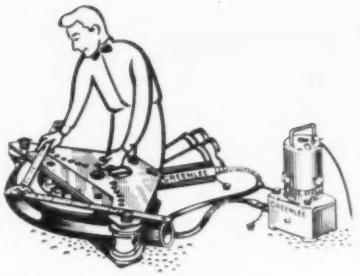


22. Multiple zone control

Multiple zone control with only one circulator and one relay is provided in White-Rodgers' new zone control package for hot water heating. Designed for hydronic heating, the "Fashion" thermostat and a small motorized water valve maintain the desired temperature in each zone, eliminating need for extra circulators, relays and flow control valves.
White-Rodgers Co.

23. Warehousing

Warehousing in the gas industry must be found for a wide variety of miscellaneous pipe, valves, elbows, and joints in every size, shape, and weight. Custom-designed equipment from Palmer-Shile includes sway-free adjustable storage racks. They feature crossbars that can be placed by hand at various levels.
Palmer-Shile Co.



24. Angle bending gauge

Greenlee's angle bending gauge saves time in bending pipe and conduit. A special notched protractor design allows the exact degree of bend to be locked in. Shown here is one of the three time-saving uses: During the bending operation the gauge can be placed on the frame for easy checking and reference. Each gauge has informative bending data plus a handy rule.
Greenlee Tool Co.

TRADE LITERATURE

25. Valve line

Ohio Injector has condensed its general catalog into a 28-page publication listing its complete line of industrial valves. Valve figure numbers are indexed for finger-tip reference by topics; face to face dimensions are supplied in full size ranges. A valve comparison chart offers a quick cross reference to the most commonly used figure numbers of 10 valve manufacturers.
Ohio Injector Co.

26. Blowers and Compressors

Three new bulletins have been published by Roots-Connersville Blower. One (AF-258) is an 8-page revision covering R-C type AF rotary positive blowers. This up-dated revision includes new capacities and pressure ratings. Bulletin LAH-158 covers the medium-pressure line of Spiraxial compressors, including design and construction data. A new compact design for R-C rotary positive blowers is presented in Bulletin RAS-158.
Roots-Connersville Blower

27. Gas purification

Performance data and photos of typical industrial applications of the Girbotol gas purification process are outlined in a new booklet from Girdler Construction. The Girbotol amine gas purification process is used for natural gas, refinery gas, and synthesis gas

FOR MORE INFORMATION

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purification; carbon dioxide and hydrogen sulfide recovery; liquid hydrocarbon desulfurization; hydrogen purification, and inert gas preparation.
Girdler Construction Div.

28. Choosing electric plants

D. W. Onan's new four-page, illustrated folder not only tells what should be considered in selecting an electric generating plant, it also features on-the-job pictures. Described are the company's highly portable gasoline models and high-capacity models (both gasoline and diesel).
D. W. Onan & Sons Inc.

29. Full-encirclement saddle

Tube Turns' full-encirclement saddle, widely used in the gas and oil industries where hot taps are needed, is described in Bulletin TT 866. Dimensional data, cyclic life and correct welding procedures are presented.
Tube Turns

30. Moisture monitor

Monitoring water content of gas lines is one of the jobs of CEC's new 26-302 moisture monitor. The simple-to-operate precision instrument is described and illustrated in new literature.
Consolidated Electrodynamics

31. Oil and water measurement

Measurement of oil and water in geological cores by the Model 104 nuclear magnetic resonance analyzer is described in a report from Schlumberger. Material Study Report 9.58 covers sample preparation, testing procedures and computations, results achieved and curves that were obtained.
Schlumberger Well Surveying

32. Flow tube

The recently developed, lightweight, corrosion-resistant insert plastic Dall flow tube is the subject of a 4-page, 2-color bulletin from Builders-Providence. The new Dall flow tube is made of fiberglass-reinforced epoxy or polyester resins with metallic throat lining. It is available in a variety of sizes and flange and throat materials.
Builders-Providence Inc.

33. Liquid level controls

Tank and bin level control systems are presented in a bulletin from Industrial Nucleonics Corp. Measurement and control of liquid level in tanks by AccuRay level detector-controller and AccuRay continuous level measurement systems are discussed and illustrated.
Industrial Nucleonics

34. Booster systems

"How to Design, Specify and Buy Large Volume Water Heating Systems" is the title of a 24-page book from Cleveland Heater. This handy reference book contains full instructions, tables and charts to simplify estimating water heating requirements for various commercial-type installations.
Cleveland Heater Co.

35. Heat exchanger

A complete revision of the fluid cooler (air-cooled heat exchanger) sales catalog has been completed by Trane Co. Because of the specialized uses of the air-cooled exchanger line, about one-third of the catalog is devoted to the types of units normally used in various industrial and process cooling applications. Among these applications are gas transmission stations, for gas inter- and and after-cooling, lube oil, and engine jacket water cooling.
Trane Co.

36. Commercial heaters

Nesbit Series K gas-fired unit heater is covered in bulletin 400-1. Described is the completely redesigned unit that will provide efficient, automatically controlled gas heating for factory, showrooms, garages, warehouses and other commercial or industrial installations.
John J. Nesbitt Inc.

37. Conversion burners

Conversion burners from Timken Silent Automatic Products are illustrated in a new 6-page folder. The burners are for residential furnaces and steam or hot water boilers (either square or round). Included are dimensional drawings, cutaway views, specifications, ratings, and text on design and installation features.
Timken Silent Automatic

38. Safety relief valves

The recently expanded line of McDonnell 230 and 240 series safety relief valves for hot water space heating boilers is covered in a new 4-page bulletin. Diagrams and basic facts bearing on selection and installation of relief valves in keeping with the current requirements of the ASME low pressure heating boiler code, Section IV, are included.
McDonnell & Miller

39. Cutting torches

A complete line of Oxwel flame-cutting equipment is described and illustrated in a 6-page folder from Linde Co. Torches that can be used interchangeably with every fuel gas combination are described. Manual and machine-cutting equipment for use on every flame-cutting job are covered.
Linde Co.

40. Digital computer

Digital computer control and data logging are covered in a new reference bulletin from the Thompson-Ramo-Wooldridge Products Co. Comprehensive discussions of process control, data logging, pilot plant, and test facility applications for computer control systems are presented.
Thompson-Ramo-Wooldridge

41. Excess temperature

An excess temperature protective device, the Alnor Pyrotac, sounds an alarm and/or shuts down upon reaching the safe maximum temperature. This instrument is described in an 8-page bulletin. Complete specifications, schematic application wiring diagrams, and operating principles are presented.
Illinois Testing Laboratories

42. Mass spectrometers

Bulletin 1824C from Consolidated Electrodynamics describes the company's process-monitor mass spectrometers. The instruments, designed to continuously measure the amount of the various constituents in a process stream, have been produced especially for the gas petroleum, and chemical industries.
Consolidated Electrodynamics

43. Telemetering

Audio-tone multi-function telemetering and control units are the subject of a 4-page bulletin from Builders-Providence Inc. The bulletin includes photos, diagrams, dimensional drawings, and specifications of the Synchro-Scan system, as well as descriptions of its design features and operational data.
Builders-Providence Inc.

LEAKAGE SURVEYS
by
SOUTHERN
CROSS
FORESTERS
Atlanta 6, Ga. MElrose 4-4227

Budget billing . . . Central's system pleases all (continued from page 108)

The gimmick cleaned up back bills so painlessly that it became a customer relations accomplishment. The machines still continue in use although the depression that brought them about has happily departed. Some housewives insist that they remain. They let the credit money accumulate, then withdraw it in a lump for Christmas shopping, vacation trips or the like. Central, happy to please a patron, goes along.

The valley of the depression coincided with the introduction of natural gas to Sioux Falls and made more difficult its acceptance. Like other firms, Central ran into the usual resistance to selling natural gas for heating—its premium (at that time) cost, fears of the adequacy or dependability of supply and the like. To soften this resistance, Central came up with another wrinkle. It entered into contracts with patrons in which the firm guaranteed, if the bill exceeded a specified total, to take out the conversion burners and restore furnaces to burn their original fuel. The firm neatly boxed up grates, firebrick and the like in each home as evidence of its readiness to live up to the agreement.

The effectiveness of this approach was offset in part by South Dakota's weather. Sioux Falls has a prairie climate, which means that the temperature will vary from around 115 in the summer to —40 in the winter. About 40 per cent of the entire year's heating bill comes between Jan. 10 and March 10. Customers were being walloped by the biggest bills of the year at a time when,

Mrs. Nelle Hudkins, Central Electric & Gas Co. customer service clerk at Lincoln, Neb., signs up a budget account customer as district manager H. A. Thorson looks on.

swamped by Christmas bills, auto license fees, income tax and insurance premiums, they could least afford them.

"For awhile there, we were taking out as many conversion burners in the winter as we were putting in during the summer," Mr. Deane recalled wryly.

Action and reaction followed automatically. Reluctant to lose customers, Central arranged for patrons to stretch out their bills over a convenient period of time, paying monthly sums until they were caught up. The next logical step, which suggested itself, was to formalize the arrangement by putting bill payment on a budget contract basis.

In installing the system, the firm made no effort to push it. Instead, it let customer preference determine the extent of usage. The budget plan, begun in 1933, was extended to 700 customers. As times improved, patrons went back to conventional billing until approximately 100 continued on the budget plan.

The next chapter came in 1954. Central serves a network of smaller communities. Aside from Lincoln and Sioux Falls, its divisional points are Columbus, York, Beatrice, Plattsmouth and Norfolk—most of them smaller than 20,000 in population. All are primarily agricultural trading centers whose economic welfare mirrors that of the farmer in the surrounding countryside.

Drouth has been making it tough for the farmer the last three years. In that period, Nebraska's moisture deficiency is equivalent to the loss of one year of normal rainfall. For Central, this circumstance translated into an upward curve of customer arrearages.

Mr. Deane, by now at Lincoln as vice president and utilities division chief, brought the drouth-tested solution of his South Dakota days to the problem of drouth-engendered collection problems. Central installed the budget plan on a system-wide basis, refined on the basis of experience. It has been pushed vigorously since.

Results since mirror both public acceptance and the effectiveness of company sponsorship. In 1954, the system picked up 1000 budget customers. In 1955, the number in-

Put trench spoil off the road —the 80W will pull it back

Keep traffic lanes clear, put your spoil off the pavement. The Cleveland 80W backfiller pulls spoil from opposite side of trench, backfills *toward* itself, works parallel to trench and to traffic.

As it backfills, the 80W simultaneously compacts fill, the right way, from the bottom up. Leaves no voids around pipe—no settling, now *or* later.

Result: a clean, safe, *completed* job.

The 80W backfills *away from* itself, too. Stays off lawns, sidewalks and completed work.

Fits *all* job conditions.

The CLEVELAND TRENCHER Co.

20100 ST. CLAIR AVE. • CLEVELAND 17, OHIO

Good Everywhere ®

Central Electric's budget billing plan gains momentum

creased to 4,500; in 1956, to 5000 and in 1957 the total stood at 6000. Vice president Deane would like to see all customers on a budget basis but concedes that it will find its widest acceptance among medium and low income patrons. However, since this is the group that presents the bulk of collection problems, this limitation promises no pain.

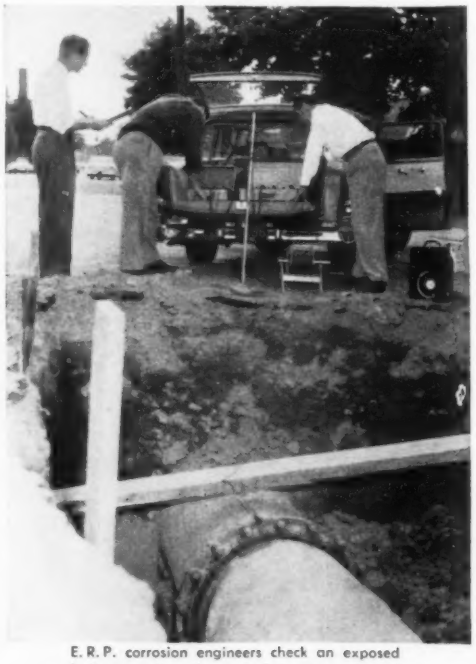
Central's budget setup is conventional. The budget season, preceded by a burst of advertising promotion, begins June 1. The firm will accept no budget accounts after September. The basic 12-month program will be altered if the customer desires. Some people ask to go on a basis of 10 months or some other period. The firm goes along with the customer.

Usually a shorter period is sought because a patron likes to have the summer period free of bills. With some customers, the firm has found, such accounts are testimony to feminine wiliness. Some women sign up on a nine-month basis, say, but will carefully neglect to tell her husband, who comes in each month to pay the bill. Unknowing, he pays it for 12 months. Three months of credit accumulates which the woman in turn draws out. Central, which figures its business is that of selling gas rather than domestic arbiter, says nothing.

When June comes, actual billing is balanced against budget collections. Usually budget payments hit within 2 or 3 per cent, one way or the other, of actual billing. If there is an average, the firm is guided by customer preference whether the money is applied against the next year or whether a cash refund is made. Similarly, the customer de-

E. C. Deane, now vice president and utilities division manager of Central, first started the budget program during the depression.

Engineering PLUS . . . makes the difference in pipeline cathodic protection



E. R. P. corrosion engineers check an exposed leak area. Here they correlate pipe potential and line current measurements for electrolysis.

It takes a lot of know-how to protect a pipeline from corrosion. That's why corrosion engineers at E.R.P. keep abreast of the latest instrumentation. Whether they are protecting an old pipeline or preventing corrosion on a new line, they use every modern method to be sure each cathodic system is as effective as possible.

That's what makes the difference in E.R.P. cathodic protection: engineering when the cathodic system is designed; when it's installed; when periodic corrosion surveys are made to check for environmental changes.

If you are looking for pipeline protection, E.R.P. is ready to serve you. For full information write for Bulletin E-47.41.

ERP CATHODIC PROTECTION SINCE 1935

ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE: ELECTRO, NEWARK, N. J.

cides how the matter should be handled if he owes money. The 1955-56 season was unusual in that a cold winter made bills run about 10 per cent over the budget total. Some patrons paid a lump sum; others, if they chose, could pay off the balance over any convenient period. A few had the amount tacked on their new budget contract and extended the period of payment for a year.

Mr. Deane concedes that budget contract paperwork, with the variants permitted by the company, makes for more bookkeeping. But, he said, any increased cost is more than offset by lessened pressure on the collection department.

Recently, he said, he had the divisions at Beatrice, Columbus, and Norfolk make a cross-sectional survey of patrons who, before going on the budget plan, had been perennial collection problems. Of the patrons surveyed, only one was found to be in arrears.

With 97 per cent saturation in Central's territory, the budget plan hasn't meant an increase in heating business, Mr. Deane said. But it has had positive benefits nonetheless. It has held people to gas who might otherwise have changed to another fuel, he believes. It has been a helpful weapon in the scramble for sales of such appliances as ranges, water heaters and dryers where active competition exists.

The two big advantages of the budget plan, Mr. Deane said, is that it eases the two biggest problems in the heating business.

One is psychological. Ask a man with an annual heating bill of $150 and a January bill of $30 how much it costs for gas and he's apt to reply, "Thirty dollars a month." With the budget bill he thinks in terms of cost being what it is—$12.50 a month. This colors his attitude towards both the company and the bills.

The other advantage is that, for all practical purposes, the budget plan eliminates the problem of delinquencies. Patrons who are problems cease to be problems when they're on the plan. And when a person falls behind in his bill, the company immediately tries to get him to go on a budget basis. Thereupon he, too, ceases to be a problem. ■

There are more DAVEY "Auto-Airs" in service today than the combined total of all competitive makes!

Here are a few of the many reasons for this overwhelming preference

The Davey Hydrovane Rotary "Auto-Air", driven direct from the truck engine through a Davey heavy-duty power take-off, is the world's most portable compressor. It moves from job-to-job as fast as the truck will travel.

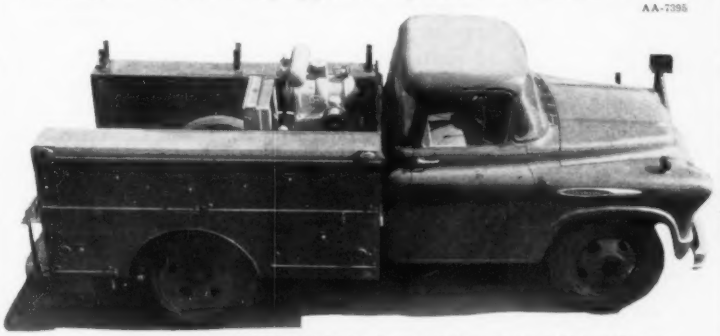
Price of complete compressor-truck unit compares favorably with trailers of same capacity.

"Auto-Air" occupies only one-third of truck body space. Rest is available for transportation of men, tools, materials.

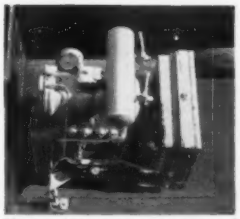
Davey is the only manufacturer that builds the complete "Auto-Air" . . . covers compressor and take-off with one guarantee.

Standard "Auto-Airs" are available in 125 and 160 c.f.m. capacities . . . other sizes on special order. They can be mounted on most standard trucks with any type of body. Write for Bulletin E-230.

AA-7395



Typical Model 125 Hydrovane Rotary "Auto-Air" installation.



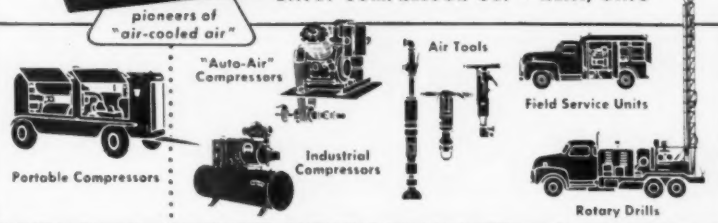
Note extreme compactness of Hydrovane Rotary Compressor.

Davey Hydrovane Rotary units have 50% fewer working parts than ordinary compressors . . . are easy and economical to operate, maintain, service.

DAVEY

pioneers of "air-cooled air"

DAVEY COMPRESSOR CO. • KENT, OHIO



EMERGENCY or REPAIR
well-equipped maintenance trucks carry
REGENT FLOW-STOP
PIPE SQUEEZERS
Equipped with safety locknut to allow mechanical locking during use and elimination of gas flow caused by temperature fluctuation on the hydraulic system.
IDEAL FOR:
Emergency shut-off
Repairing leaks
Repair of ruptured service lines and mains
Permanent closing service
Speeds-up trenching operations
Relocates lines and mains
Lines up pipe for welding
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a versatile hydraulic tool for the gas industry!
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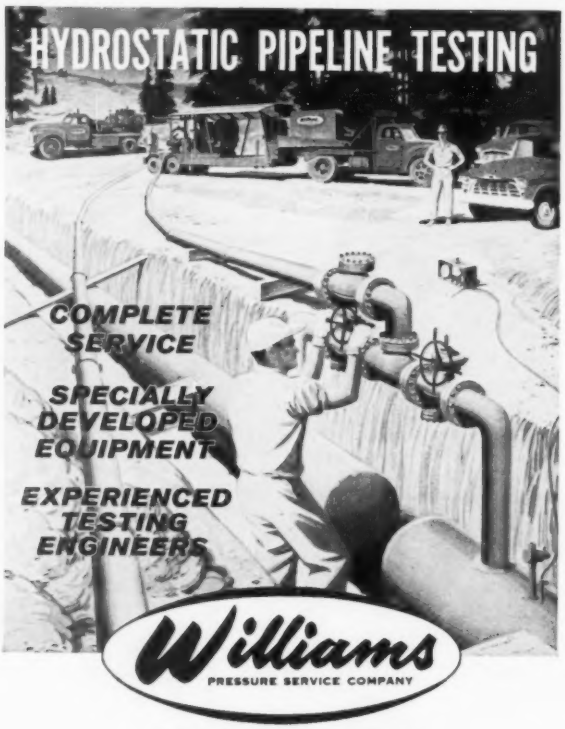


GAS·PEOPLE

DAVID M. HESKETT has been appointed superintendent of the gas department of the Tucson (Ariz.) Gas, Electric Light & Power Co. He succeeds C. H. WEBBER, who retired recently after 36 years of service.

LOUIS E. BOLIVER has been appointed annuities and benefits administrator for the Peoples Natural Gas Co., Pittsburgh.

Minneapolis - Honeywell Regulator Co. has announced organizational changes in its Industrial Products group. Under the new set-up, GEORGE M. MUSCHAMP is group vice president-engineering and O. B. WILSON, formerly Brown sales vice president, is group vice president - marketing. JOHN M. WILSON, head of design and development, becomes director of engineering. R. L. MALLORY, former southwest regional manager, is assigned to the newly created post of sales manager. J. A. ROBINSON, field sales manager, was appointed sales manager of Brown Instruments division. HOWARD J. MACDONALD, assistant general manager, was named general manager of the valve division; and H. EARL BENSON, senior sales engineer in the Cleveland regional office, becomes sales manager for Rubicon division.

CALEB S. TAFT is now manager of the American-Standard plant in Buffalo, N. Y. Acting manager since December, 1957, Mr. Taft succeeds GILMORE ROBERTS who has retired.

THOMAS F. BARTLEY is the newly named field sales manager of RCA Whirlpool home appliances for Whirlpool Corp., St. Joseph, Mich. Mr. Bartley, former range sales manager, will assist General Sales Manager John Crouse. Assisting Mr. Bartley is GERALD L. HARTMAN as range sales manager.

ORVILLE M. SHOCKLEY has been named secretary-treasurer of Rocky Mountain Natural Gas Co., Denver.

FRANK KOHLES has been named general sales manager of the William Wallace Co., Belmont, Calif. Until his recent appointment, Mr.

Kohles was sales manager of the company's Metalbestos division.

JOSEPH A. RESCA has been named New York district sales manager for the Burroughs Corp.'s Electro-Data division.

JOHN D. BONDURIS, JR., is filling the newly created post of manager of market research in the sales department of the Alabama Gas Corp., Birmingham. Most recently employed as research analyst on the staff of Birmingham's Committee of 100, Mr. Bonduris formerly was with Southern Natural Gas Co.'s statistical and planning department.

WILLIS STAFFORD has been promoted to sales promotion and advertising manager of Detroit Controls division of American-Standard. Most recently he handled sales promotion for the company's refrigeration products.

Madison (Wis.) Gas & Electric Co. elected several new officers recently. JOHN ST. JOHN, an officer for more than 50 years and president since 1940, was named chairman of the board. THERON A. BROWN, vice president and general manager, is now president and general manager, and a director. WILLIAM A. MCNAMARA, formerly with the law firm of Rieser, Mathys, McNamara and Stafford, was elected financial vice president and a director.

DR. J. F. DUNN has been appointed assistant director of research of the Walworth Co., New York. Prior to joining Walworth last year, Dr. Dunn was a project leader in the dynamic analysis and control laboratory at the Massachusetts Institute of Technology.

Several appointments have been announced by San Diego (Calif.) Gas & Electric Co. WILLIAM H. NEILD is now industrial gas sales engineer, succeeding E. H. ADLER, who has retired. Mr. Neild joined San Diego in 1950 as gas sales representative. Since 1956 he has been serving as sales engineer in the industrial gas sales department. DONALD W. PINE has succeeded OTTO KETELSEN as commercial gas sales supervisor. Mr. Ketelsen has retired. Mr. Pine joined the company in 1948 as heating engineer in industrial gas sales. Two years later he became commercial gas sales engineer.

BASOID® valves

NEW!

Advanced design features INDEPENDENT PILOT OUTLET plus broad range of Btu / hr capacities

BRIEF SPECIFICATIONS		
Model	Inlet & Outlet	Btu/hr. at 1" P.D.
AEC	1"	417,000
	¾"	340,000
AHC	¾"	214,600
	½"	177,600
AKC	½"	158,360
	⅜"	129,000

Basoid valves give you this advanced feature—*an independent pilot gas take-off upstream from the main automatic gas valve.* It's designed particularly to meet manufacturer's requirements in unit heaters and central heating appliances.

The Basoid valve also features a Baso power unit and solenoid valve, providing long-life, trouble-free operation, assuring complete, automatic gas shut-off.

Basoid valves, suitable for any fuel gas, are offered in a variety of current types, and a broad range of Btu/hr. capacities. Solenoid coils, power unit and pilot valves, and reset assemblies can be replaced in the field as complete units.

Whatever your automatic valve requirements, there's a Basoid valve designed for your product.

For more technical information on BASOID valves, *WRITE*...

BASO INC.

Dept. SC-6 • MILWAUKEE 1, WISCONSIN

(Formerly Milwaukee Gas Specialty Company)

people • *Continued*

C. W. FITZPATRICK, who retired on Sept. 1, has been succeeded as claims agent by DAVID F. CURTIS.

GEORGE E. DOTY has been named vice president and general sales manager of Grove Valve & Regulator Co., Oakland. The company also appointed three regional sales managers and a service manager. R. L. BRIGGS will serve as central regional sales manager with offices in Tulsa; W. J. HANCOCK will head the eastern region with offices in Houston; and C. W. COOK will direct western region sales with headquarters also in Houston. F. A. FERGUSON, as national service manager, also will maintain his headquarters in Houston.

K. G. Christensen
PG&E

Norbert Grainer
General Controls

Hilding V. Beck
American Meter

Stephen H. Baer
PLGS

FRANK P. SAPONARO has joined H. Zinder & Associates, Inc., Washington, D. C. Before joining Zinder, Mr. Saponaro served as vice president of Algonquin Gas Transmission Co in charge of rates, sales promotion, regulatory and gas supply problems.

ALEXANDER L. BUPP, assistant treasurer, has been appointed manager of planning by Bucyrus-Erie Co., South Milwaukee, Wis. The new post includes corporate planning, market research, organization planning and office management.

KENNETH C. CHRISTENSEN, treasurer of Pacific Gas & Electric Co., San Francisco, has been elected vice president and treasurer. He joined PG&E in 1931 in the valuation departmnt. In 1944 he became assistant treasurer and was elected treasurer in 1952.

HILDING V. BECK, chief engineer at American Meter Co. since 1954, has been named vice president and chief engineer. Before becoming chief engineer, Mr. Beck served in the research and engineering departments. He joined American Meter in 1936.

NORBERT T. GRAINER, assistant to the manager of the Skokie (Ill.) plant of General Controls Co., has been appointed regional manager in the Middle West. He will headquarter in Cleveland.

STEPHEN H. BAER has been promoted to the newly created post of public relations director of Pacific Lighting Gas Supply Co., Los Angeles, a Pacific Lighting Corp. subsidiary. Mr. Baer formerly was news-publications bureau manager of Southern Counties Gas Co., also a PLC subsidiary.

THE *FINEST* FOR MODERN GAS DISTRIBUTION SERVICE

NORMAC

Malleable Couplings

Normac Insulating Malleable Couplings and fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets.

Insulating Couplings AND Fittings

Malleable Service Ell

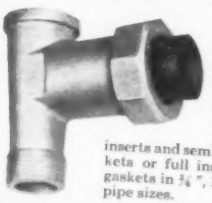
The insulating principle depicted above is carried out in all Normac Ells and Tees.

NORTON McMURRAY has specialized for 20 years in the development and production of products solely for the Gas Industry. Whether your plans include modernization, or new, expanded facilities, Normac Gas Distribution Equipment will serve you well.

Insulating Gaskets

The Normac insulating principle incorporates an efficient combination of a polyethylene sleeve and a semi-insulating gasket or full rubber gasket and retainer ring.

Brass Fittings



Normac insulating Brass compression end Tees, Ells and all compression end fittings are available with polyethylene inserts and semi-insulating gaskets or full insulating rubber gaskets in ¾", 1" and 1¼" iron pipe sizes.

New CATALOG
Write for your copy . . . it gives complete details and specifications of NORMAC equipment.

NORTON-McMURRAY Manufacturing Co.
919 North Michigan Avenue
CHICAGO 11, ILLINOIS
Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees and Ells

Deaths

F. WARREN COOPER, SR., 60, retired vice president and controller of Public Service Electric & Gas Co., Newark, N. J., died recently. Mr. Cooper retired from Public Service last year after 27 years of service. He was past chairman of the AGA accounting committee.

R. L. FLETCHER, former president of Providence (R. I.) Gas Co., died recently. He was 66. He joined Providence Gas in 1918 as plant assistant superintendent. He later served as plant superintendent, vice president and engineer. He served as president of the company from 1948 until August, 1957, when he retired. An active industry man, Mr. Fletcher served actively in the New England Gas Association and the AGA. As chairman of the AGA's domestic research committee in 1942, he revitalized the work of that committee which aroused the industry to the need for a greatly expanded research program. In 1939 he was awarded the Meritorious Service Medal of the AGA in recognition of his work in maintaining the company's service after the 1938 hurricane and flood.

CORROSION PREVENTION

Continued from page 27

drain point end had already been found properly insulated.

The difficulty was finally traced to the temporary anode. An abandoned light standard, it still had a conduit connected to it—and this conduit was found to be in contact with the line under test! Since it represented only a relatively short length of small diameter tubing, it did not in itself constitute a major load on the system; but, connected as it was, it formed a metallic path for a large part of the current which was thought to be flowing through the soil from anode to pipe.

When the offending contact was cleared, the test was re-run, using a current of only 1.0 amp. This gave a potential shift of 550 mv at 1200 ft, and of 420 at 16,800. A calculation of R from these data yields the value of 0.563 ohms, which is much more consistent with the original 0.605; the discrepancy here is probably due to experimental error. ■

Testing barhole for gas leakage

pin-point gas leaks quickly... accurately with

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J-W GAS-POINTER Model H

GAS-POINTER locates leaks in buried pipelines and provides readings in 2 ranges—0-1.0 l.e.l. (lower explosive limit) and 0-100% for direct reading of actual gas concentration. The unit is useful also for testing manholes and valve boxes and as a general purpose indicator.

Exclusive design features permit range changes without electrical switching or zero change—and without addition of dilution air.

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Each body electrically welded into one unit with bed reinforced. Sturdy and economical . . . weatherproof compartments with recessed paddle-handle door locks.

Write for literature on service bodies, line-construction bodies, side boxes, and King Winches.

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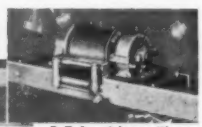

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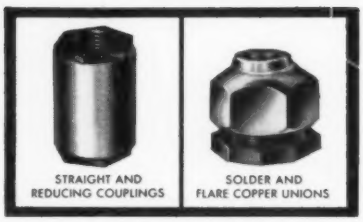

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manufacturers of: MAYCO water softeners & filters . . . MAYCO dielectric fittings

Oven furnaces . . .

Continued from page 106

trols, installed the large oven furnace as the answer to several heat treating production problems. The furnace—made by Surface Combustion Corp. and one of the largest ever shipped from the company's plant as a packaged unit—was developed by Surface engineers in cooperation with Reliance.

Wide difference in the sizes of parts to be heat treated and the need for many different heat treat cycles complicate the heat treat production of Reliance. To minimize handling of parts within the plant, Reliance wanted a unit small enough to be used adjacent to the production area. Installation of the large Surface oven furnace has eliminated these production problems and cut the cost of heat treating. The complete unit, including controls, covers an area 12 ft by 12 ft. The inside dimensions of the furnace, 6 ft x 6 ft x 6 ft, enable Reliance to handle large weldments, forgings and castings. Shafts 63 in. long are easily handled in an upright position to prevent warpage. Smaller parts are basket loaded. Typical parts are motor frames, brackets, alloy shafts, spiders and V rings. Some parts are treated to refine grain structure for optimum electrical properties. Others, such as

To change furnace from one cycle to another, all that is necessary is to change a cam on the control instrument.

large fans, are stress relieved.

Parts are brought from the adjacent production area by fork lift truck and loaded directly into the furnace. The furnace's counterbalanced door is raised and lowered by an air cylinder. This cylinder also serves as a check to cushion the door on closing and prevent it from dropping at too fast a rate.

Operating range of the furnace is from 600° to 2000°F. This makes it possible to stress relieve at temperatures as low as 600° and also anneal and normalize at temperatures well below the maximum operating range of the furnace. Program control on this large oven-type furnace has been made possible through the use of Surface Combustion's Conjecto-Firing system. With this system, which uses twin nozzle tunnel burners, a wide range of operating temperatures can be achieved.

The twin nozzles of the burners, located one above the other, are manifolded to separate sources of fuel and air supply and may be operated simultaneously or independently. In the lower temperatures, one nozzle introduces a supply of air which mixes intimately with the hot products of combustion from the second nozzle. This gives a large volume of heated gas, thus promoting quick and uniform heating through convection. At the higher temperatures, *both* nozzles fire for faster heating of the load. After the load reaches operating temperatures, one nozzle can be cut out and the other nozzle can be used to maintain holding temperature.

On cooling, air can again be introduced through one nozzle for uniform controlled cooling.

Program-controlled heating and cooling cycles are made possible in this oven-type furnace through the Surface Conjecto-Firing system. By combining this system with a cam-actuated recording controller made by Brown Instrument Division of Minneapolis Honeywell, Reliance Electric is able to perform any desired heat treating operation automatically.

Typical cycles include:

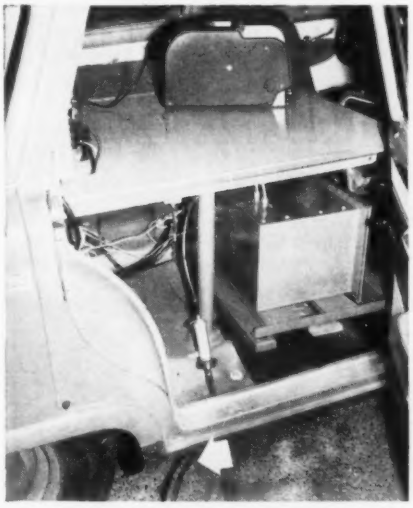
Stress relieve:
7500-lb load
Hold furnace at 400°F

INFRA-RED MOBILE UNIT PICKS UP ATMOSPHERE SAMPLES AND INDICATES GAS LEAKS ON CHARTS

Developed by Heath Survey Consultants to Improve Securing of Gas Leak Data . . .

Interior of Heath Infra-Red mobile unit, showing chart on which gas leaks are indicated. Instrument operator marks street locations on chart as vehicle travels.

To improve the efficiency of present leak detection methods, mobile infra-red gas analyzers have been developed by Heath Survey Consultants, Inc. As the mobile units are driven along city streets or transmission lines, escaping gas is picked up by suction tubes which protrude from the vehicles. The presence or absence of methane is recorded on a strip chart. Use of the mobile equipment makes leakage control safety surveys more complete and more thorough than previously possible.



Close-up photo shows one of the pick-up tubes (arrow) extending below car. Above tube is dust filter for removing impurities in the sample.

OVER 1,000,000 MILES OF MAINS SURVEYED

In the U. S. A. and Canada, the Heath firm has safety-surveyed over 1,000,000 miles of gas mains using several methods developed by Heath people after many years of experience with Winter Leakage surveys and Vegetation-Soil leak location surveys.

For additional information about Heath Leakage Control Safety Surveys, write to: HEATH SURVEY CONSULTANTS, INC., 573 Washington Street, Wellesley, Massachusetts.

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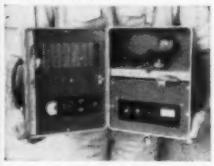

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Two to three hours controlled cooling to 600°F

Anneal:
7500-lb load
Hold furnace at 400°F
4 hr to 1550°F/1575°F
2 hr soak
10 hr controlled cooling to 600°F

Normalize:
7500-lb load
Hold furnace at 400°F
4 hr to 1650°F
2 hr soak
10 hr controlled cooling to 600°F

At present cams for six different programs are in use. Others are being developed as the need arises. To change from one program to another the cam on the control instrument only needs changing. To operate the furnace, all that is necessary is to light the pilots, place the load in the furnace, close the door, and push the furnace control start button. The furnace then automatically heats and cools through the program set by the cam. The furnace will automatically shut itself off at the end of the heat-treating cycle.

This large oven-type furnace incorporates a durable, well designed hearth, supported on sturdy, accurately spaced firebrick piers. The hearth is capable of supporting heavy loads under continuous operating conditions with minimum maintenance.

Bottom burners are staggered to direct their fire across under the hearth from both sides of the furnace into individual cross connected chambers between the hearth support piers. To aid in uniform flow of combustion products, openings are provided between hearth ledges and furnace walls along the sides of the heating chamber. This provides maximum travel for the hot gases and intimate contact with the charge.

Flame at no time directly impinges on the material being heated. Burners in the top of the furnace are also staggered on opposite sides. These are directed in a line with the furnace arch, thus preventing impingement on the top of the load. ■

Small size, large capacity air conditioners coming

Smaller gas air conditioning units with increased capacity will be marketed in the near future, the AGA's air conditioning promotion committee learned recently.

Seven leading manufacturers of gas air conditioning units reported on present products and research for the future.

Committee chairman W. W. Selzer, Columbia Gas System Service Corp., said quieter units with increased economy and efficiency are undergoing final tests. Not only will they cool and dehumidify more efficiently than other type units, but they will purify air by ridding it of odors and germs, he reported.

Cooperating in the report were Arkla Air Conditioning Corp., Bryant Manufacturing Co., Carrier Corp., Comfort Products Inc., Ready-Power Co., Weatherbuster Corp., and York Corp.

North Shore celebrates 50th year of operation

Fifty years of progress — the theme of North Shore Gas Co.'s golden anniversary celebration— was highlighted recently when city officials and dignitaries toured the company's facilities in Waukegan, Ill.

Highlights in the company's history: Incorporation as Winnetka Gas Co. on July 16, 1908. (Name was subsequently changed to North Shore Consolidated Gas Co. and then to North Shore Gas Co. in 1911.)

At time of incorporation, there were 5100 customers living in Waukegan, North Chicago, Highland Park, Highwood, Lake Bluff, Lake Forest, Libertyville, Glencoe, and Winnetka.

1909—Extension of mains to serve Deerfield.

1910—Gas was supplied to Mundelein and construction started on a battery of 12 Semet-Solvay coke ovens for manufactured gas in Waukegan.

1917—Great Lakes got gas service, and in 1920 service was started in Fort Sheridan.

In the following years the company's expansion continued with service extended to Forrestal Village, Farnsworth, Rosecrans, Beach, Knollwood, Half Day, Ap-

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We cordially invite our friends to visit the new plant any time they are in the vicinity.

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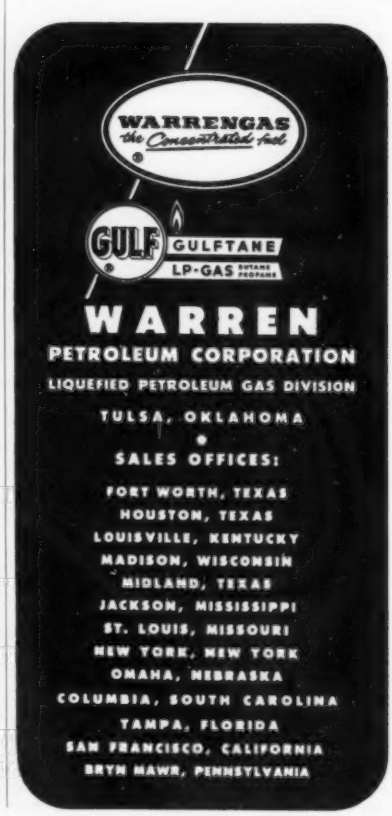

takisic, Third Lake, Druce Lake, Rondout, Wildwood, Lincolnshire, and Loch Loman. Venetian Village, the most recent addition, was put on the list in May.

North Shore converted from manufactured to natural gas in 1947. Customers now number 51,708, more than 10 times those served in 1908.

Niagara extending area

Niagara Mohawk Power Corp., Syracuse, N. Y., is planning to extend its service area to northern New York by building more than 100 miles of line from Watertown to Massena.

President Earle J. Machold said that, subject to regulatory approval, the company will build the line to make gas available to Ogdensburg and Massena in 1959. Service to other northern New York communities will be extended as requirements for gas increase.

NI-Gas trims heating list

With the arrival of new gas supplies expected about Jan. 1, Northern Illinois Gas Co. has told about 35,000 customers that they may start using gas for residential space heating.

Some 30 MMcf of gas daily will be received by the Bellwood, Ill., company when Natural Gas Pipeline Co. of America completes its new facilities.

Northern Illinois' president, Marvin Chandler, said that when the additional customers avail themselves of gas space heating, NI-Gas will be serving nearly 295,000 heating customers. This compares with about 35,000 in 1946 when limitations first went into effect.

"Despite our constant efforts to obtain sufficient supplies to meet the demands of customers," Mr. Chandler pointed out, "we will have about 100,000 on our waiting list."

Consumer rate cut sought

California's attorney general's office has asked that utilities be compelled to take advantage of a federal tax law that would permit the companies to lower consumer rates.

Filed with the state PUC, the petition contended that the commission should make utilities comply with the 1954 federal law to speed up write-offs on plant expan-

sion, thereby reducing their federal income tax.

Asserting that utilities must "minimize costs of doing business consistent with the fair rate of return and efficient service to customers," the petition said consumers should not have to pay for "phantom taxes" in their utility bills.

New plant for Robertshaw

Robertshaw-Fulton Controls Co. will build a $2.5 million plant for production of thermostatic control devices for home appliances and industry near Youngwood, Pa., on the Pennsylvania Turnpike.

President T. T. Arden said the new plant will replace present manufacturing facilities operated at Youngwood and at nearby Scottdale by the firm's Robertshaw Thermostat division. The company has a foundry at Scottdale and manufactures the control devices in Youngwood.

SIS • News Notes

In a special election, voters of Davenport, Iowa, approved the request of Iowa-Illinois Gas & Electric Co. for a new 25-year gas franchise.

Battle Creek (Mich.) Gas Co. has placed $600,000 of first mortgage bonds with insurance companies. Participants were Mutual of New York and the National Life Insurance Co. of Vermont. Proceeds will be used to retire bank loans and for construction purposes.

Thirty per cent of the first RCA Whirlpool gas refrigerators sold went to customers who were replacing gas refrigerators 16 or more years old. The survey also revealed that 56 per cent of the RCA Whirlpool gas refrigerator buyers had been using gas refrigeration, 34 per cent had depended on electricity, and 10 per cent were buying a refrigerator for the first time.

Washington Natural Gas Co., Seattle, has filed an application with the SEC to issue 100,000 shares of common stock. Proceeds will be used to retire bank loans

victimizing vegetation?

Leaking bell-and-spigot joints can ruin your public relations efforts. Vegetation damage means unhappy customers . . . unnecessary expenses. It puts pressure on your profit picture.

To solve the problem of dried out bell-and-spigot joints, gas utilities have turned to CARBOSEAL Brand Anti-Leak. By swelling the jute and hemp fibers as much as 44 per cent of their dry volume, CARBOSEAL Anti-Leak can eliminate leakage . . . with an estimated effective life of up to 25 years!

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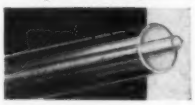

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made for construction purposes. Principal items of expenditure will be for new mains and services in the area between Seattle and Tacoma, and expansion into areas not now served.

Texas Machinery & Equipment Co., Amarillo, is distributing Parsons Co. equipment in western Texas.

Corrosion Services Inc., Tulsa, has expanded its operations in the Cleveland, Ohio, area. CSI specializes in corrosion prevention work. Hartley J. Davis, formerly Tulsa office manager, has transferred to Cleveland as manager of the new facilities, made necessary to meet demands for service in the East Central section of the U. S.

Construction is under way on Robertshaw-Fulton Controls Co.'s new eastern research center. Slated for completion before the end of the year, the center is located 15 miles from Philadelphia in King of Prussia.

Blaw-Knox Co. plans to convert the foundry at its Buflovak Equipment Division in Buffalo to additional modern fabrication and manufacturing space. Conversion will add about 30 per cent more area to the manufacturing facilities. The Buffalo plant makes processing equipment for the gas industry as well as the food and chemical industries.

Five gas-fired Counterflo warm air space heaters will be installed by Dravo Corp., Pittsburgh, in a 460-ft long car shed at the new sintering plant of U. S. Steel Corp. at Saxonburg, Pa. The units thaw coal to facilitate unloading from rail cars. Each will have a 1 million Btu per hr output capacity. Installed in an inverted position, the heaters will discharge heated air into a trench below the car tracks at the rate of 12,500 cu ft per minute per heater.

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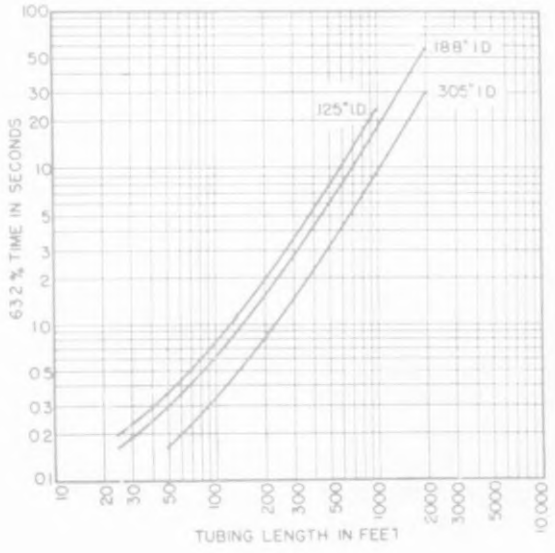
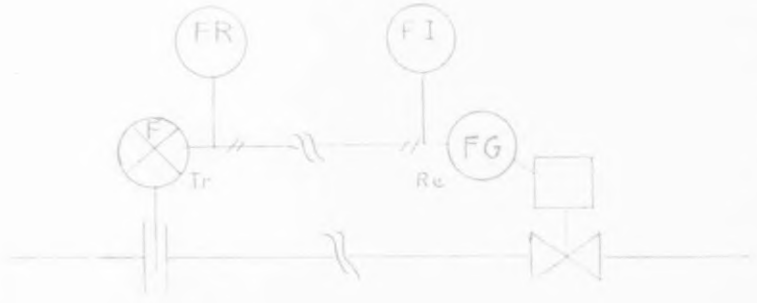


Applications of receiver-controller transmitter systems



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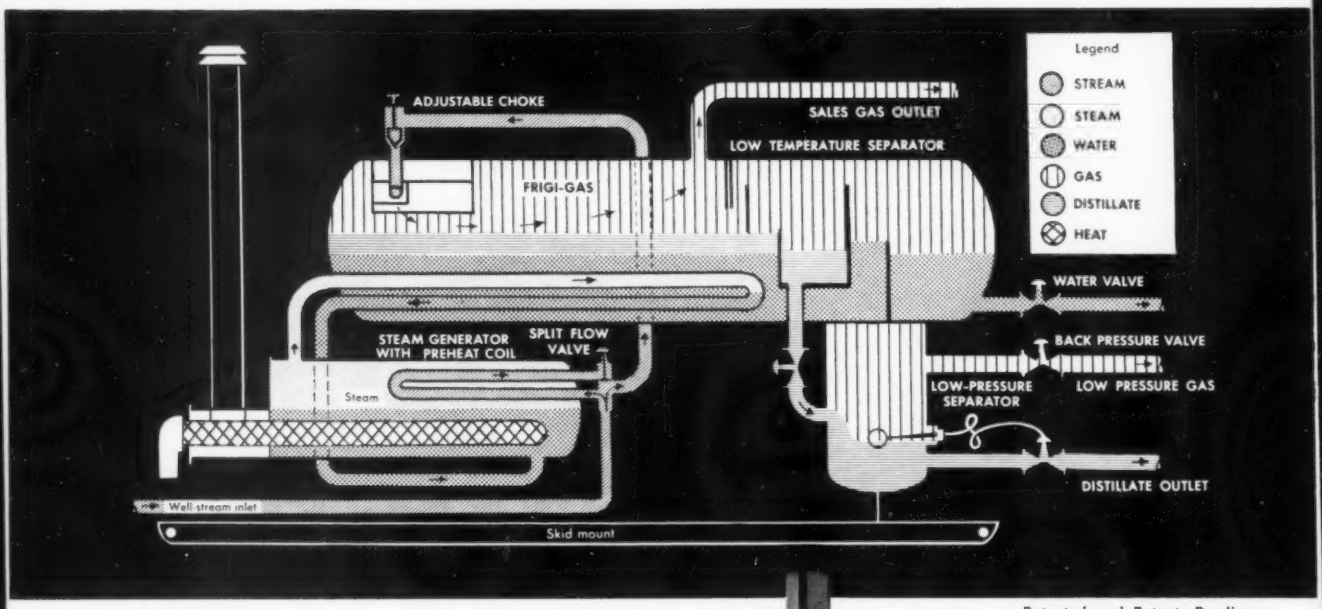

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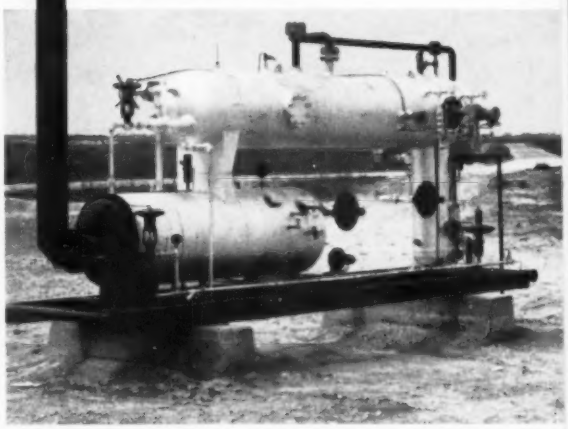

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Receiver-controller transmitter systems applications

Compressor stations, extraction plants and gas systems have expanded so that an operator cannot cover his area of operation to read meters or make adjustments. Now the component instruments are available to produce a control system that will do these things for him.

By CHESTER S. BEARD

WHAT invariably becomes the subject of the conversation when a group of technical men are together? You're probably wrong. It is communications. The wider the scope of operation, the more important becomes the study of means of conveying information. This is particularly true of measurement and control systems just as it is in governments, companies and organizations.

Compressor stations, extraction plants and gas distribution systems have expanded so that an operator cannot cover his area of operation to read meters or make adjustments. Long static or sampling lines become difficult and contribute to lags and inaccuracies. Many of the measurements such as specific gravity, engine speed, liquid levels in traps or tanks, or valve position must be taken locally. This condition has caused pneumatic or electrical transmission to gain in popularity. By these methods, the measurment is made locally and the reading, or value, is transformed into a pressure or electrical impulse. The receiver indicates or records the impulse on a scale that is calibrated in terms of the range of the

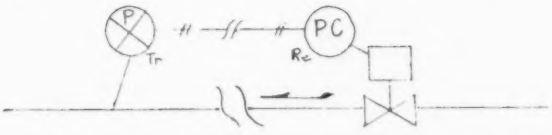

Fig. 1. Pneumatic transmitter output operates receiver-controller.

Fig. 2. Receiver-controller readily mounts on the control valve.

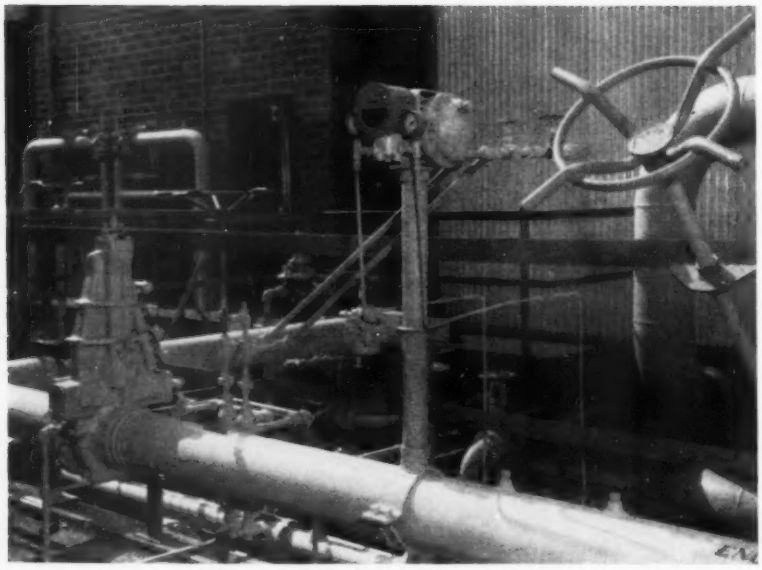

Fig. 3. Measurement lags are decreased by close proximity of transmitter.

measuring device. By this method, the usable reading more truly reflects the value of the variable with less time lag between the instantaneous value and the reading.

The receiver may be a controller in this transmission system. It is then necessary to deliver an impulse from the controller to an actuator which positions a valve or other device to obtain control. This transmission back and forth introduces an additional time lag depending upon the distance to the actuator and various constructional features of the actuator.

Component instruments have been available for many years for a control system approach which eliminates many of the disadvantages of locating the control mechanism at a remote, although convenient point. This system consists of a pneumatic transmitter and a receiver-controller integrally mounted on the actuator. Although instrument engineers have been taking advantage of this system, it would seem that the advantages warrant more recognition and use.

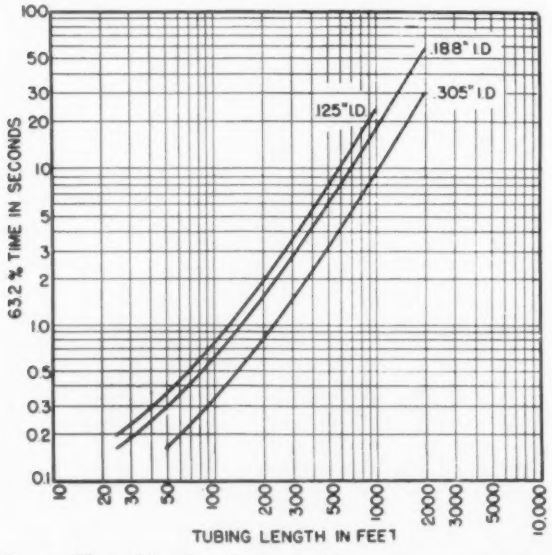

Fig. 4. Effect of length and size of tubing upon transmission lag.

So that we are all thinking alike, a short description of the receiver-controller system follows.

This type of controller (*Fig. 1*), which is one type of which is shown mounted on the yoke of a valve in *Fig. 2*, puts out a varying pressure to position a pneumatic actuator just as any other controller would do. The difference is that the controller in this system reacts to an air pressure signal from a pneumatic transmitter. To avoid misunderstanding, the pneumatic transmitter is an instrument which can measure a variable such as speed, specific gravity or differential and deliver an air pressure directly proportional to the variable.

An accepted output range of a transmitter is usually 3 to 15 psig. For example: using a 0-100-in. differential element as a measuring element, the transmitter would put out a 3-psig pressure at 0 on the measuring element and 15 psig at 100 in. As the output is linear, the output would be 9 psig when there is 50 in. on the measuring element.

When a controller using a measuring element (including a 3-15-psig range) is used, setting the control point at 9 psig would be comparable to setting the controller to maintain a flow to create 50 in. differential across an orifice. By this approach, the 9-psig setting would always obtain control at half the range of the transmitter. Using speed as an example, this would control at 150 rpm using a transmitter with a range of 0 to 300 rpm. By this approach, the same basic controller is used to control any transmittable variable.

In this control system the transmitter is installed at the point of measurement to decrease the measurement lag as much as possible. Correct placement of the transmitter can decrease lag in static lines of flow, pressure or differential pressure applications (*Fig. 3*) to a negligible amount as related to other lags. The time lags involved in causing temperature changes to register through thermowells predominate,

so measurement lags in temperature systems are not increased or decreased appreciably by location of the transmitter. Short sampling lines are beneficial in transmission of varying physical characteristics such as specific gravity or Btu value.

Evaluation of lags in transmission systems as well as their effect upon control loop has been tested extensively. A step upset will cause a lag between a transmitter and receiver which will vary with magnitude of change, mean operating pressure, length and size of tubing, direction of change, and volume of receiver element. The characteristics of the transmitter would affect the time constants so most tests are run by supplying the transmitted signal or pressure from a tank which can be considered as infinite capacity in relation to the flow required for a test.

Probably the most useful test using the step upset approach is shown in *Fig. 4*, which shows the time lag* (63.2 per cent time constant) using different sizes of copper tubing over varying lengths. Use of the 3-15-lb change gives a maximum effect due to upset, consequently it is valuable for most considerations. Various tests have been run to show the effect of length of transmission lines upon the stability of control. These tests are run using rapid load upset and also for sinusoidal upsets at various frequencies. They emphasize the desirability of decreasing transmission lags—a condition which can be accomplished using the transmitter (receiver-controller) technique. It has been reported that a system showing excellent control at optimum proportional band setting and automatic reset setting with 200 ft of lines becomes difficult with 600 ft of lines. With the longer lines an upset continues at a low level for an unreasonable length of time.

It has been stated that many variables, flow included, could be held much closer to a constant value than is now possible if the valve or other control unit could make a corrective action simultaneously with the deviation from the set point of the controller. Although advances have been made in measurement methods used in transmitters, this development has not kept pace with the advances made in the dynamic characteristics of controller and actuators.

* It has been shown mathematically that the time required to reach 63.2 per cent of the possible change caused by a "step" upset is the lag coefficient or time constant of a system.

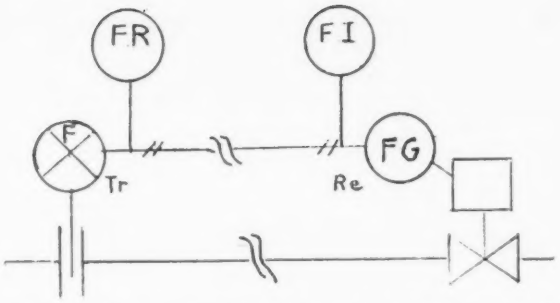

Fig. 5. Output of transmitter may be used to indicate or record as well as control.

Combinations of transmitter-controller equipment are innumerable and vary according to what must be accomplished. The simplest approach is a transmitter which directly delivers a pressure to the integrally mounted receiver-controller (*Fig. 1*). In this system, the set pressure is obtained by manual adjustment of the controller.

Another simple system cannot be neglected even though some may question its inclusion. The receiver-controller may be used as a pressure or level controller within its range (normally 0-20 psig) with the static or controlled pressure piped directly to the controller.

Pressure above the range of the controller may be introduced into a ratio relay which in this case is used as a transmitter. This unit discharges air at a set ratio to the static pressure. This ratio may be one-to-one or at least as high as six-to-one. This means that a static pressure of 120 lb would be transmitted as 20 lb; thus allowing use of the receiver-controller. The one-to-one relay may be used when it is advisable to keep the line fluid out of the transmitting or controlling unit. It will also eliminate liquid head variations when the controller must be installed below the static connection.

Indication or recording can be taken directly from

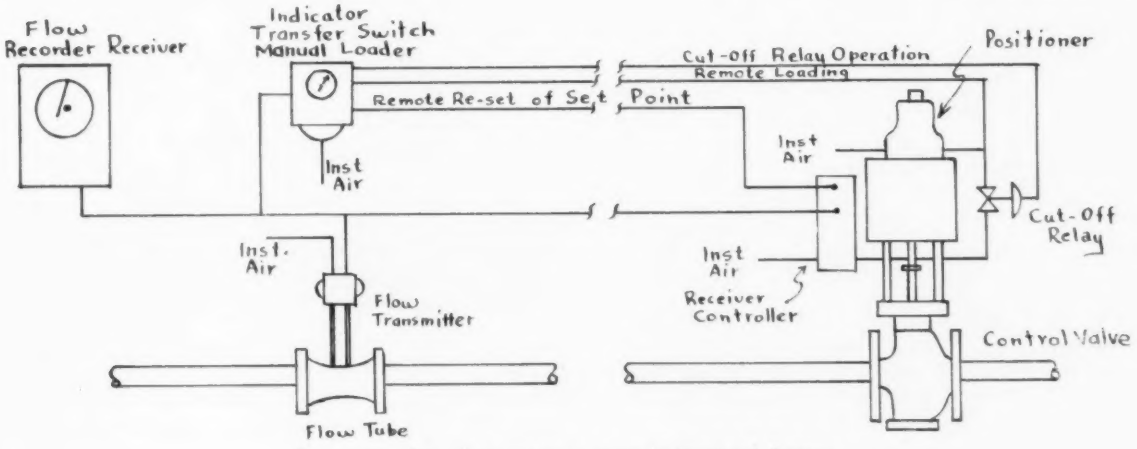

Fig. 6. Versatility of the system is shown by functional diagram.

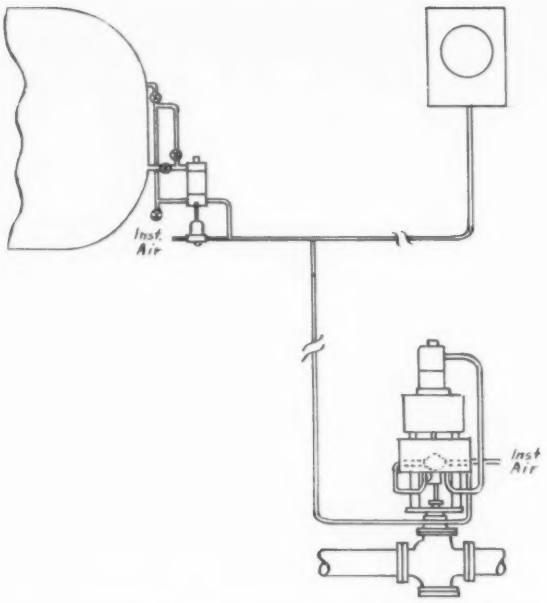

Fig. 7. Displacement or differential level transmitter may be used in the receiver-controller system.

the line to the receiver-controller as in *Fig. 5*. The impulse from the transmitter may be used for a record because this pressure output varies directly as the variable throughout the desired measurement range. Another way of expressing this relationship is to say that the transmitter operates at 100 per cent throttling range. The characteristics of controller action such as variable throttling range and automatic reset, may be incorporated in the receiver-controller. Derivative action may be included in the controller or obtained by an external relay unit. The external relay may be of the direct or inverse derivative type. Throttling range is momentarily decreased by direct derivative action and momentarily increased using the inverse derivative relay.

Remote resetting of the set point is accomplished by using an instrument air regulator at the remote station to vary pressure to the "control setting" chamber of a stack controller or the remote control point setting bellows which may be installed in other receiver-controllers.

A cut-off relay may be installed in the controller air line between the receiver-controller and the actuator to obtain manual remote operation of the actuator. Introduction of air into the operating diaphragm of this cut-off relay shuts off the controlled air pressure so that the pressure loading on the actuator may be varied with an instrument air regulator.

All of these functions, including use of a valve positioner, are shown diagrammatically in *Fig. 6*. In this diagram, flow is being measured by a differential transmitter of a type similar to *Fig. 3*, across an orifice plate. The transmitter output is delivered to a recorder, a receiver-controller and an indicating control station. The output of the control station instrument air regulator may go through a selector switch to vary the set point of the controller or to the actuator for manual remote loading. A relay must be energized to cut off the output of the controller when manual remote loading occurs.

Operating conditions will dictate use of a positioner just as it would be in any control system (GAS April and May 1952). The necessity for a valve positioner to overcome the lag caused by a long line from the controller to the actuator is eliminated by the use of the receiver-controller.

The following are just a few of the multitude of applications for this system:

1. The point at which constant pressure control is required is, in many cases, quite distant from the control valve. This may occur on a gas fuel manifold which is being held at a constant pressure to furnish gas to a line of foundry pots. The static connection should be close to a central point while the control valve is at the head end of the manifold.

2. Viscosity of fuel oil precludes long static lines. A transmitter mounted "close coupled" at the point where control is desired will give true pressure measurement which may be utilized by the receiver-controller.

3. Liquid level may be determined by measuring the differential pressure between the vapor space and a reference point below the liquid level. This system has advantages over the use of a float. Hysteresis, which is inevitable in transferring ball float movement to the outside of a vessel, is eliminated. The

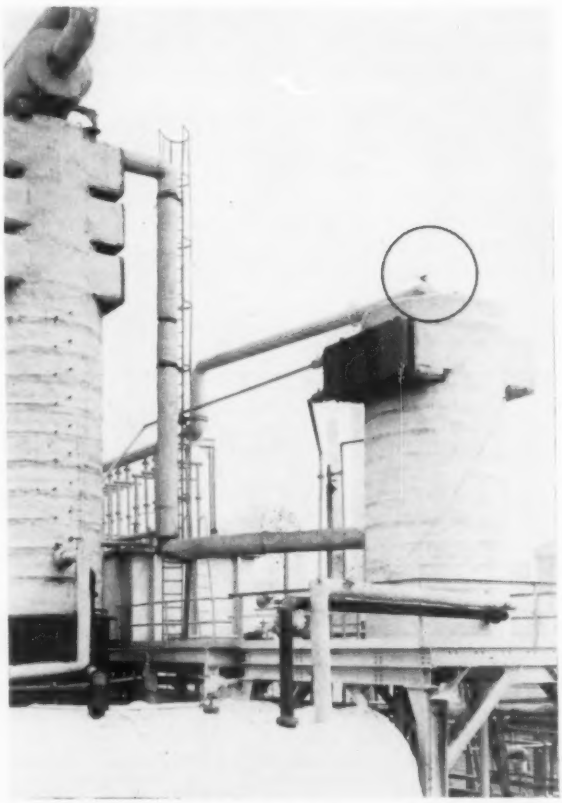

Fig. 8. Temperature-sensitive bulb in inaccessible location actuates the transmitter.

differential method, which is sometimes called "floatless control," overcomes any difficulties in determining level in a boiler on shipboard. The depth of liquid or range of measurement is unlimited as compared to the ball float.

The displacement float offers another versatile means of measuring level. With this method, the float is always partly submerged. The change in movement of the float is very slight and is caused by the buoyancy change caused by submerging more or less of the float. Either of these means of measuring level may be accurately transformed into a transmittable pressure. Use of the receiver-controller (*Fig. 7*) with this transmitted output is an improvement over most other methods of level control.

4. A large portion of temperature control applications, particularly oil or gas heaters, require the control valve to be fairly distant from the temperature sensitive element. Although control may be very accurately obtained using a potentiometric controller, this is not always warranted for economic reasons. There are limitations to the length of capillary tubing of a bulb system which is advisable, particularly for use with direct-operated valves. A temperature transmitter (*Fig. 8*) does a very fine job when used with the receiver-controller.

5. Density measurement of liquids or specific gravity of gas is a good example of the type of instrument which must be installed close to the point of sampling. Measurement lag, as well as pressure loss required to create a differential through long sampling lines, contribute to this requirement. Many instruments such as the specific gravity transmitter (*Fig. 9*) measure and transmit physical and chemical variations in a product.

6. This control system may be applied to many applications using metered control. Using metered control, the volume of a product such as fuel is varied to satisfy requirements of a furnace, heat exchanger or accumulater tank. In this system, temperature or level is measured by a controller. The output of the controller is used to reset the set point of a receiver-controller on the control valve. Using compressible fuel such as gas, or a heating medium such as steam, control of pressure accomplishes flow control assuming the burner orifices or other outlets are not varied.

This resumé of applications for the receiver-controller transmitter system should bring to mind other control problem children throughout compressor plants, extraction plants or heat generating installations that can be made to obey. Consider the system if you can improve stability by decreasing lags in measurement, transfer of pressure outputs, or actuator dynamic response. Also consider this method which, due to simplicity and reduction of static piping, may be more economical while accomplishing the same results. This useful and versatile tool should be put to work. ■

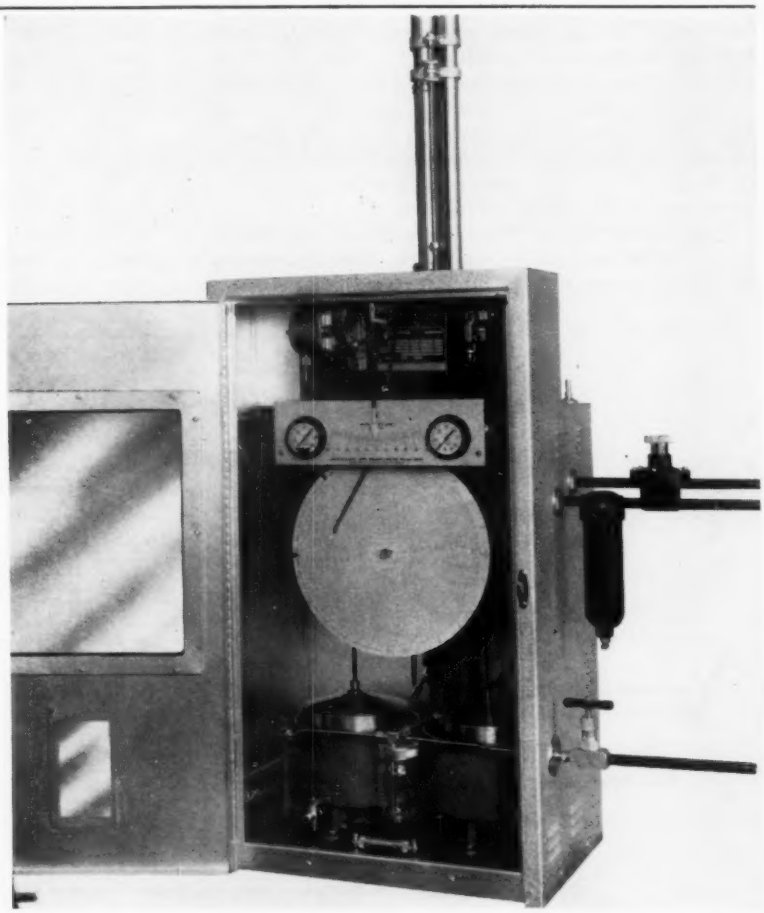

Fig. 9. Specific gravity transmitter is an example of adaptation of chemical or physical measurement instruments to the system.

Hydrostatic testing of line through fringe area of city

By KEITH BENTZ, Superintendent of Pipelines
Texas Illinois Natural Gas Pipeline Co., Chicago

THE natural gas industry has welcomed the increasing population density as an opportunity for better service to more people. This has required the solution of many vexing problems associated with housing developments adjacent to their pipelines. Safety for the public and their properties is the paramount issue and is best achieved through good construction and operating practices. Self regulation by the industry has been expressed in the requirements of Section 8 of the American Standard Code for Pressure Piping (ASA B31.1, Sec. 8).

This code defines a Class II location as fringe areas around cities and towns where the housing density in a strip ¼ mile on each side of the pipeline exceeds 20 houses per mile, and also in a similar strip of 10 consecutive miles where the housing density exceeds 12 houses for each mile. Under the testing section of the code, recommendations specify a minimum of 125 per cent of maximum operating pressure with air or water as the test medium. Natural gas is not allowed for testing purposes.

Texas Illinois Natural Gas Pipeline Co. constructed approximately 50 miles of 36-in. and 34-in. loop line in the fringe areas or environs of Chicago in 1957. Design considerations and construction practices were in accordance with code requirements. Hydrostatic testing methods were used to qualify the line as Class B construction in a Class II location under the

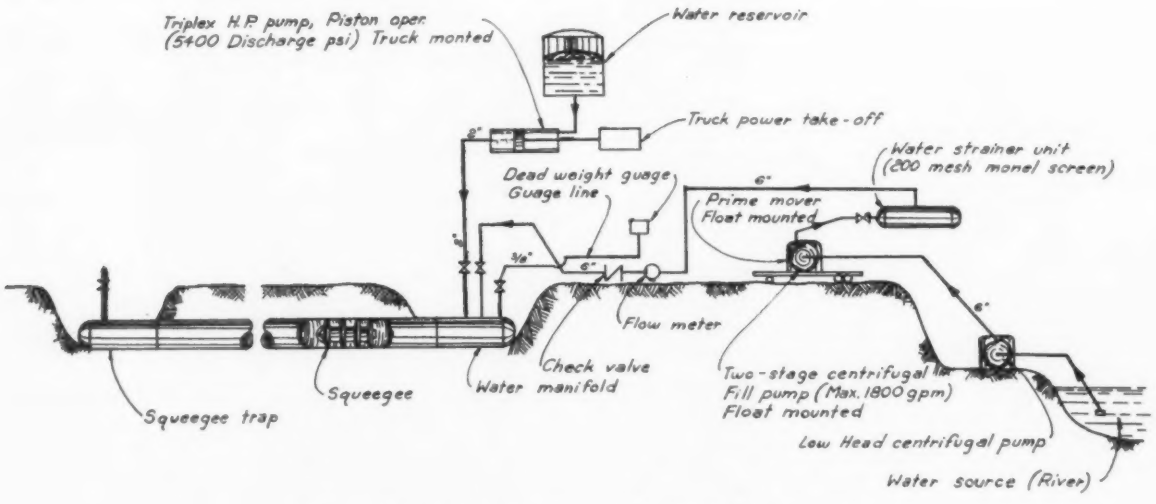

Fig. 1. Hydrostatic testing equipment furnished under contract.

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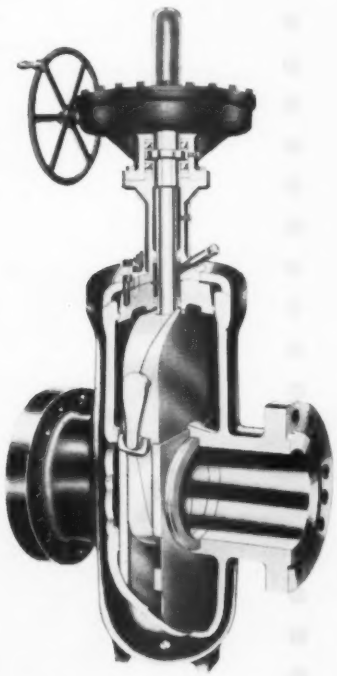

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TABLE I. PIPE AND TEST PRESSURE DATA

(1) Pipe Diam. (in.)	(2) Wall Thickness (in.)	(3) Grade	(4) Yield Press., Psig	(5) Mill Test Press., Psig	(6) Mill Test as % of Yield	(7) Min. Hydrostatic Test Press., Psig	(8) % Yield H. T. P.	(9) Max. Allow. Oper. Press., Psig	(10) Max. Allow. Oper. Press., as % of Yield
36"	0.4375	X52	1264	1140	90%	910	72.0%	728	57.6%
36"	0.500	X52	1444	1300	91%	912	63.2%	730	50.1%
34"	0.375	X52	1147	1040	91%	912	79.5%	688	60.0%
34"	0.406	X52	1242	1120	90%	912	73.4%	730	58.8%
20"	0.250	X52	1300	1105	85%	910	70.0%	728	56.0%

Note: 5. Mill Test (according to code) based on 90% of yield.
9. Maximum Allowable Operating Pressure = Test Pressure ÷ 1.25 or design pressure which ever is lesser (Class II).
Design Pressure for Type B Construction, Class II Location $P = \frac{25t}{0}$ (0.60).

code. The advantages of hydrostatic testing are primarily safety and positive control of test pressures. *Table I* shows the various grades of pipe used, together with mill test, design, operating and hydrostatic test pressures in psig. Also tabulated is the per cent of yield achieved by the various pressures.

The major items to be considered in planning the hydrostatic test is the availability of clean water, the gradient of the pipeline and a suitable place to discharge the water at the conclusion of the testing. Experience to date with available equipment indicates the test section should not exceed 40 to 50 miles in length. Special manifolds are used for connecting pump discharge piping and dead weight recorders. Squeegee traps permit venting air or gas and enables removal of the squeegee. The decision to hydrostatically test sections of, or a complete new, pipeline should coincide with the initial construction plan. This will result in providing a full opening pipeline and make provisions for squeegee traps. If less than full opening valves are specified, the contractor will lay pipe through the valve location and install the valves after the test.

The principal equipment used in the hydrostatic test was provided by Williams Pressure Service Co., Shreveport, La. The equipment items furnished under contract are as shown in *Fig. 1.*

Texas Illinois was able to use low pressure gas to clean the pipeline with a conventional steel brush pipeline pig. Following this operation a three- or four-cup squeegee was inserted at the filling unit manifold and the manifold was welded in place. The low head pumps were set at a nearby river and water was pumped through the filter into the pipeline. The water forces the squeegee ahead of the water column to displace all air or gas in the pipeline. The pipeline was filled at a rate of about one mile in three hours. Experience has developed this rate of filling a 36-in. pipeline as the best rate to assure the most effective displacement of air or gas. Delays in filling the pipeline are generally related to interruptions required to back wash the 200 mesh screen in the filter.

The fill pumps develop about 500 psig in filling the line. Filling is concluded with the squeegee in a special trap at the end of the test section. The mobile high pressure unit is then connected to the 2-in. outlet at the filling manifold. The water source or suction of this unit is from the storage tank mounted on the truck. Dead weight pressure gauge, recording gauge and spring dial gauges are manifolded and connected to the test section. During the high pressure test periodic readings were made until the predetermined maximum pressure conditions have been met. The chart from the recording gauge is a permanent record of test conditions. If the line pressure does not drop more than 13 psig in 12 hours the test is considered acceptable and the line is accepted as leak free. The line was bled to atmosphere after acceptance in preparation of water removal.

The procedure for removal of water depends on local conditions. In this case it was necessary to return the water to the source to avoid excessive damage claims by property owners since no water courses existed along the route of the pipeline. To accomplish this return it was necessary to cut the squeegee trap, reverse the squeegee, reweld the trap and connect a source of gas to move the squeegee. Conventional three-rubber and four-rubber squeegees were used. The four-rubber squeegee was a much more efficient operation and one run of this squeegee effectively removed all free water. The rate of travel of the squeegee in removing water from a 36-in. line is about one mile per hour. About 175 psig gas pressure is required for this rate of travel with water

Testing equipment on right-of-way. Fill pump is in foreground, strainer in background.

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Water being discharged through 6-in. pipeline during squeegee run to remove water from the pipeline.

discharging from a 6-in. discharge pipe.

Water removal following the hydrostatic test is an important consideration for pipelines in natural gas service. This was particularly important to Texas Illinois since one test section was under test during the winter season and sub-zero temperatures were experienced during and immediately following the test. Free water remaining in the pipeline is a constant threat of hydrate formation and could interfere with deliveries to utility customers.

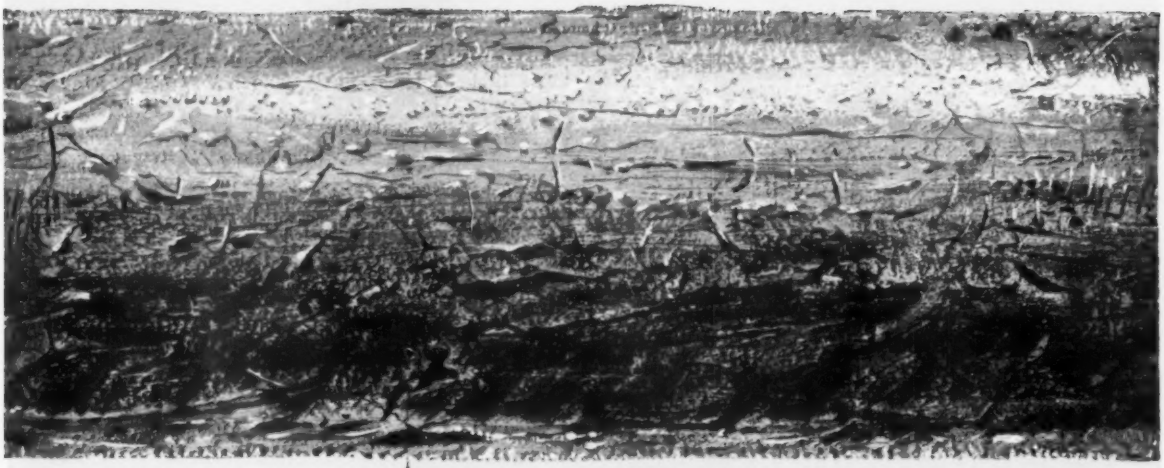
Reports of experimental studies on the West Coast indicated that 0.001 lb of water, per square foot of internal pipe surface, would be retained by a damp wall following the squeegee run. This water would enter the pores in the steel surface and adhere to the wall. This amount of water would then be available for absorption by the gas stream and would affect the dew point of the gas until absorbed.

Texas Illinois was able to dispatch known daily volumes of gas through a newly tested 9.68-mile section of 36-in. pipeline. A recording water analyzer was used to measure the water content of the gas stream through this section of the line. The water content of the gas passing into this section was known. The internal surface of this section was 376,256 sq ft. A study of charts from the analyzer showed that the gas stream absorbed 5570 lb of water in about three days required for the water content to return to normal. The daily throughput was approximately 500 MMcf of gas at about 550 psig. The highest hourly water content reading occurred about 24 hours after gas started flowing in the 36-in. pipeline.

This reverts to a total of only 657 gal. of water or one gal. of water was distributed over each 714 sq ft of internal pipe surface. Additionally, 0.0148 lb of water adhered to each square foot of internal surface. These figures were obtained where two runs of a three-cup squeegee was used. One run of a four-cup squeegee in a different section obtained better results than the three-cup squeegee. An alcohol slug can be carried between two squeegees when removing the water as an added precaution in water removal.

Hydrostatic testing procedures are believed to be more desirable in populated areas because a line rupture under air pressure will be accompanied with noise and the probability of flying objects. The water test results in most loose rust and dust being suspended in water which provides a truly clean line. A prudent operator will appreciate a high pressure test in populated areas and will gain much satisfaction by this proof of a safe line. ■

Installing section of pipe following removal of water filling manifold.



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The Dall flow tube—

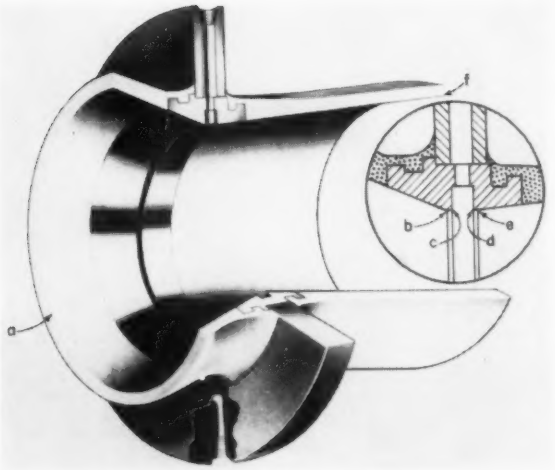

Fig. 1. Plastic insert Dall tube.

a new metering primary

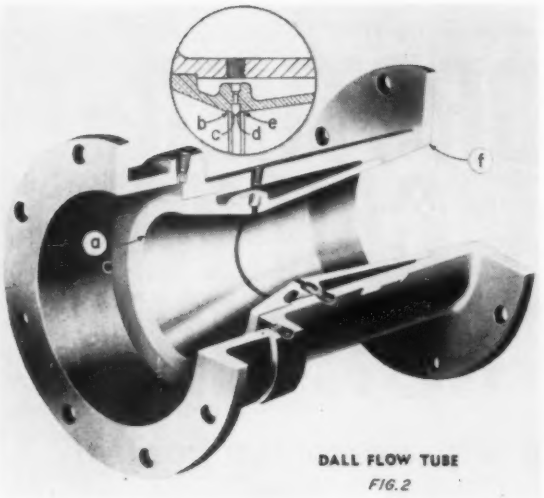

Fig. 2. Dall flow tube—cast iron and bronze throat.

Here is some factual information on one of the latest metering primary devices. These facts show that the Dall flow tube is an accurate, efficient differential producing primary.

By RODGER B. DOWDELL

Administrator of Research and Development

Builders-Providence, Inc., Providence, R. I.

THE Dall flow tube is one of the more significant late comers to the field of differential producing primary devices. It seems to disagree with all the principles which we have learned regarding fluid flow and, for this reason, is quite intriguing to most engineers. No claim is made to understand nor explain the operation of the Dall flow tube, but merely present some of the facts we have learned about it, which will enable those interested to use this new device.

The Dall flow tube was invented in England by H. E. Dall, chief hydraulic engineer for George Kent Ltd., about 1950. It operates similarly to the classical Venturi tube, but is much shorter and has considerably less pressure loss. At the present time there are three basic designs of this Dall flow tube.

Fig. 1 shows the most versatile of these designs.

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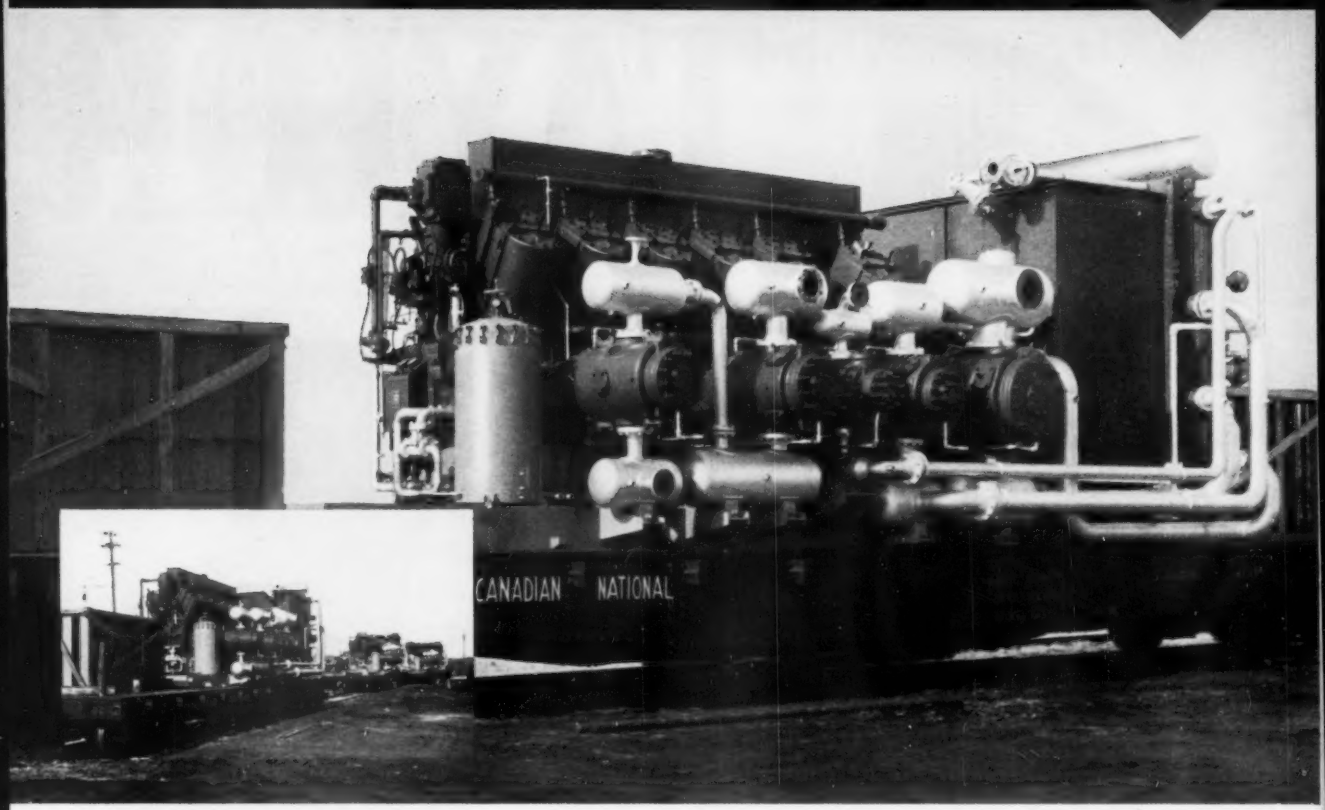

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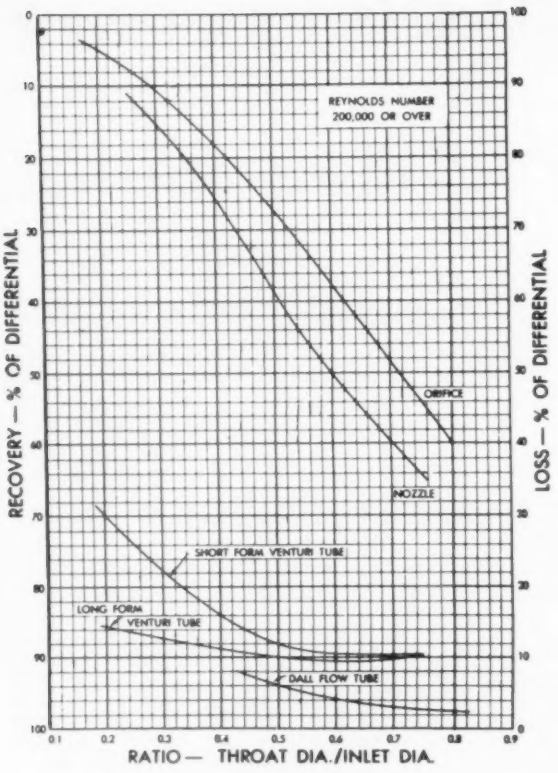

Fig. 3. Recovery characteristics of differential producer.

It can be used to meter most types of corrosive fluids normally encountered in process applications. It is constructed from a bronze or stainless steel ring inserted into a mild steel flange. The upstream and downstream cones are made from epoxy or polyester resin, reinforced with fiberglass. This model is called the plastic insert Dall tube. It is inserted into the pipeline and held by bolting the carbon steel flange between two standard flanges. It is centered by the bolts in these flanges.

The high pressure tap measures the pressure in the annular space behind the upstream cone. The other tap connects to the throat slot.

If we study the flow as it passes through this tube, we will be surprised to see a device which appears on the surface to have an extremely high loss. In *Fig. 1* the flow passes from the left to the right. It first strikes an abrupt reduction in area called the upsteam dam, Point *a*. It then passes through a converging cone to the slotted throat and then rapidly diverges out in angles considerably steeper than that of the classical Venturi tube. At the exit point, marked *f*, there is an abrupt increase in area where the outlet cone is truncated. If we examine the throat section, we see that the throat slot is preceded and followed by a small cylindrical section. In passing through the throat, the flow strikes a corner at *b*, another one at *c*, another one at *d*, and another one at *e*; all things which we would think would be conducive to a high loss.

Fig. 2 is a second model of the Dall flow tube. This model is cast iron with a bronze throat section and is used primarily in the municipal field for measuring water where the tube may be buried in the ground, and the life requirements are in terms of half a century or more. This unit is between 1½ and 2 pipe diameters long, but has the same internal contour as the insert Dall tube, except that the upstream pressure is taken at the upstream dam instead of behind the upstream cone. This change in location of the upstream tap has no noticeable effect on the performance of this tube.

There is still a third model of the Dall flow tube which is called the welded insert model, and which is primarily for high pressure or high temperature work.

Fig. 3 is a comparison of the pressure loss through several of the most common types of differential producers. The left-hand ordinate is plotted as the recovery of differential in per cent, while the right-hand ordinate is the loss of differential in per cent. The abscissa is the ratio of the throat diameter to inlet diameter. The upper curve shows the pressure loss through an orifice plate. The next curve gives the loss through a nozzle without a recovery cone, similar to the long radius elliptical nozzle commonly referred to as the ASME nozzle. The next two curves show the loss through the standard long form and short form Venturi tube, and the lower curve shows the loss through a Dall flow tube. At large diameter ratios the Dall flow tube loses as little as 2.5 per cent of the differential. This means that with only 2.5-in. wc loss, we can have a differential as high as 100-in. wc to work with.

You may question the legitimacy of presenting a loss comparison on the basis of per cent of differential instead of an absolute quantity such as inches of water loss. This is done for two reasons. First, it is found that this value of per cent of differential becomes constant for a given differential producer at

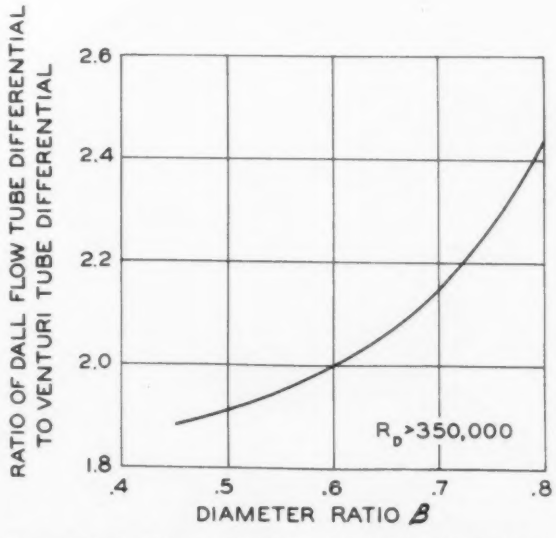

Fig. 4. Ratio of differential in Dall flow tube to that of Venturi tube.

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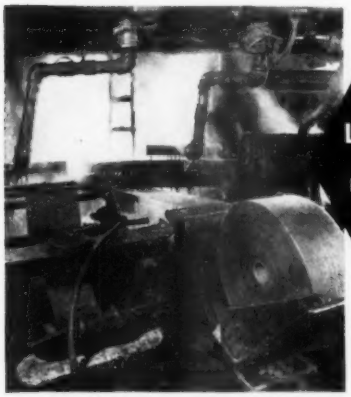

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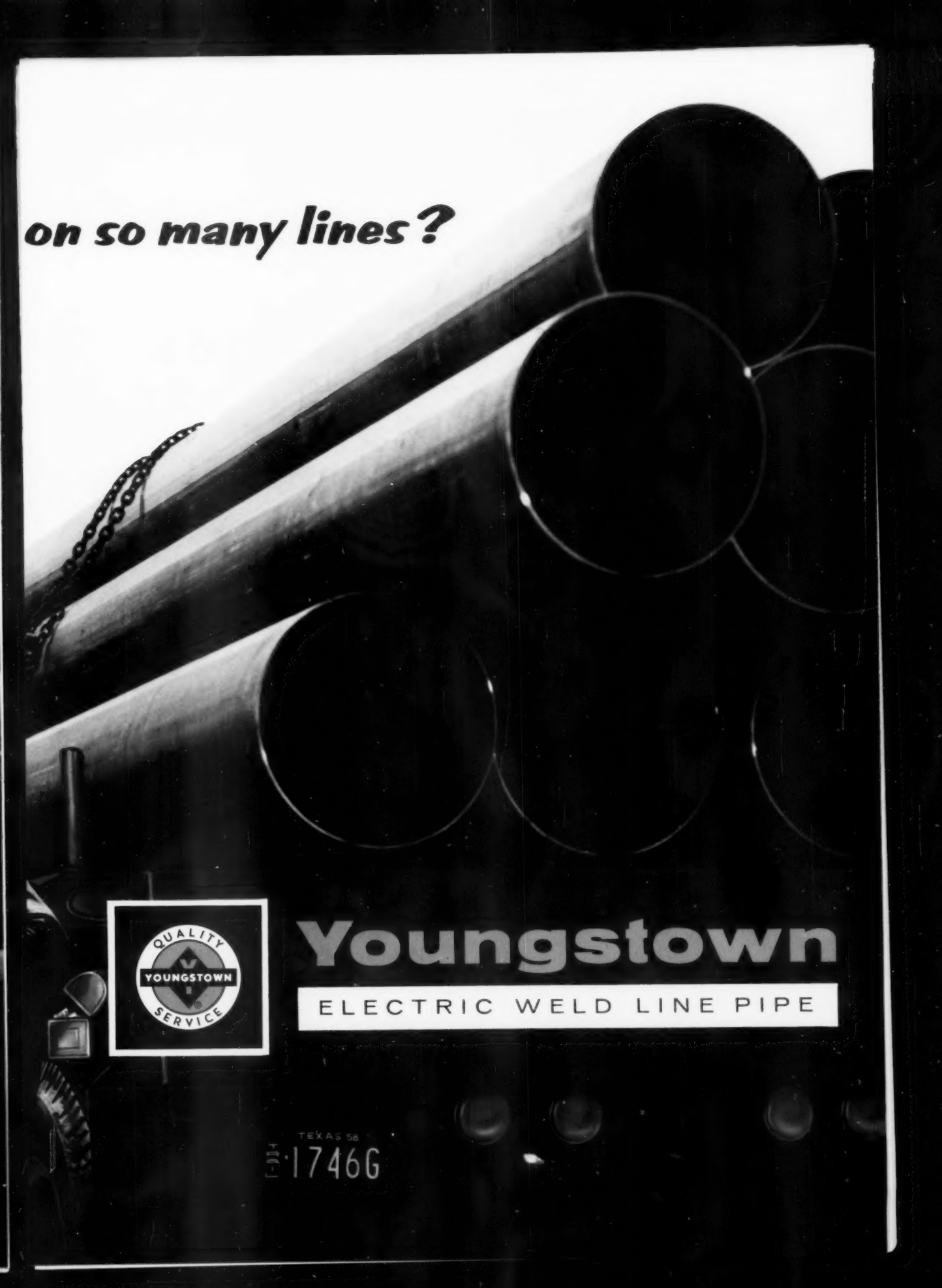
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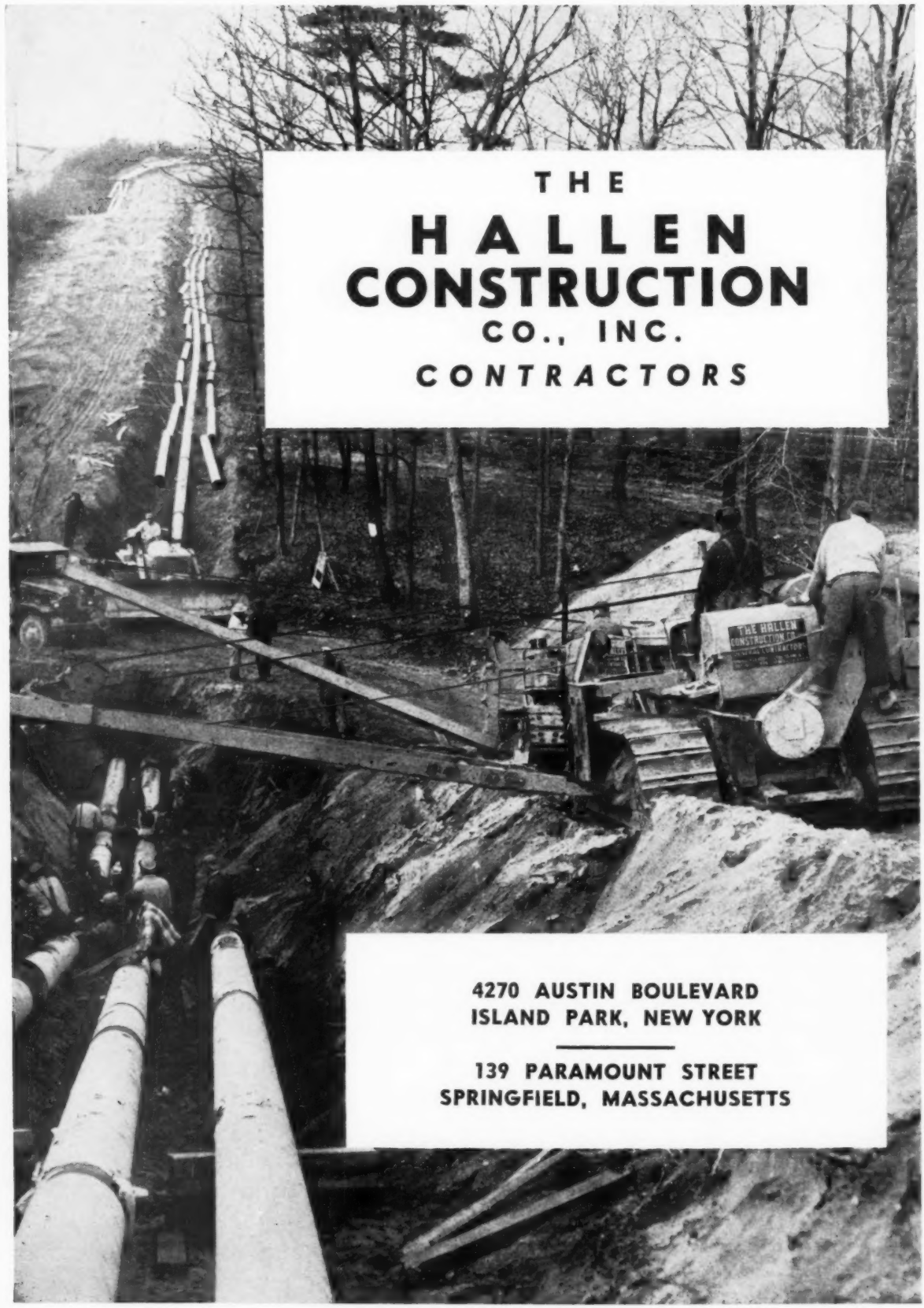
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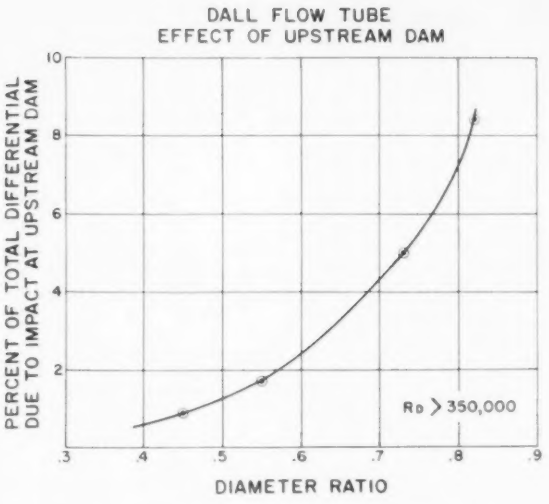


Fig. 5. Increase in differential due to upstream dam.

high rates of flow, and second that the primary purpose of a flow meter is to produce a differential which can be read or used to actuate some type of secondary instrument. The one which can produce this differential with the lowest pressure loss is considered to be the most efficient.

The pressure loss measurements were made by reading the pressure difference between a tap one diameter upstream from the tube and a tap five diameters downstream from the tube. The pressure loss in the six diameters of pipe without the Dall flow tube in place was subtracted from that with the tube in place, and the difference was taken as that charged against the tube.

Part of this low loss is because the differential produced by the Dall flow tube is greater than that produced by the Venturi tube or nozzle with the same diameter ratio. *Fig. 4* shows the ratio of the differential produced by the Dall flow tube to that produced by a Herschel type Venturi tube of the same diameter ratio. For a diameter ratio of 0.6, the differential of the Dall tube is twice that of the Venturi tube or nozzle. For larger diameter ratios, this ratio even increases.

In an attempt to explain this large differential, one first notices the upstream dam of the tube and suspects that the pressure increase due to impact is a significant factor. *Fig. 5* shows that there is an increase in differential due to this cause, but that this increase is not a very significant factor. The differential is increased from 1 per cent at low diameter ratios with the largest dam to about 9 per cent for the large diameter ratios which have the smallest dam but, of course, the higher velocities.

A larger increase in differential occurs because of the pressure distribution at the throat of the tube. *Fig. 6* shows a plot of the pressure distribution taken in the plane of the throat slot. Notice that close to the wall at the throat the tube is producing almost 2½ times the differential that it is at the centerline. This test was made on a 6-in. Dall flow tube with a .354 diameter ratio. This decrease in static pressure at the wall of the tube is undoubtedly due to the abrupt change in the direction of the flow lines as the fluid passes through this throat section.

The preceding curves and discussion show an extremely low pressure loss, even though it appears to give an extremely high loss.

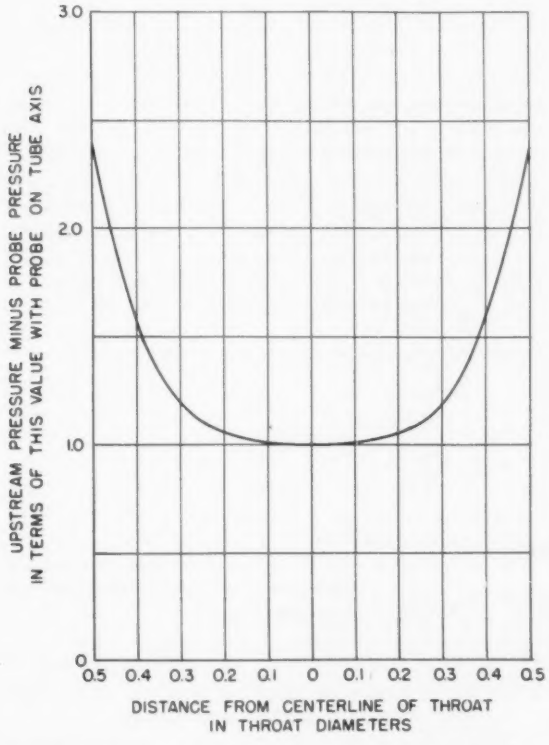

UPSTREAM PRESSURE MINUS PROBE PRESSURE IN TERMS OF THIS VALUE WITH PROBE ON TUBE AXIS
3.0
2.0
1.0
0
0.5 0.4 0.3 0.2 0.1 0 0.1 0.2 0.3 0.4 0.5
DISTANCE FROM CENTERLINE OF THROAT IN THROAT DIAMETERS

Fig. 6. Distribution of static pressure at throat of Dall flow tube.

• Accuracy of metering

The next important question which arises is that of accuracy. The accuracy of differential producers has been the subject of much discussion. In order to determine the accuracy of a given differential producer, it has been the custom for the experts in the field to get together and, using their best judgment, assign a figure to be used for the accuracy of a given meter. Usually they meant that this meter would measure the true flow within their accuracy figure, provided it was installed and used in accordance with their instructions and that the coefficient value used was taken from the proper source.

This idea of accuracy had its limitations. First, it was based on human judgment, which we know is subject to all sorts of influences and errors. It is only normal for a man to think that a meter manufactured by his company is a little more accurate than the meter manufactured by his competitor. Also, it was often the case that actual data were not available and it was necessary to extrapolate values to cover the most frequent cases.

Professor Jorissen[1] published an article entitled

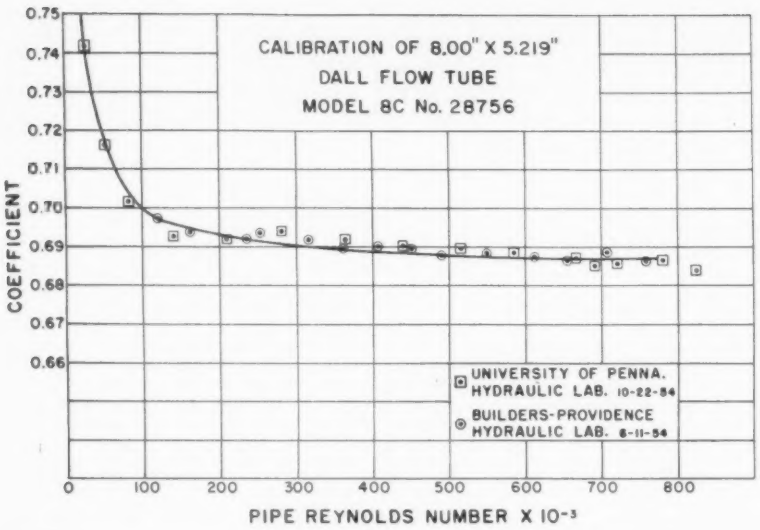


Fig. 7. Calibration of same tube in Builders-Providence laboratory and the University of Pennsylvania hydraulic laboratory.

"On the Evaluation of the Accuracy of the Coefficient of Discharge in the Basic Flow Measurement Equation." In this article Professor Jorissen presented a new concept of accuracy which he called tolerance. It is important that we take a little time to examine this concept since it can be applied to all types of measuring equipment. It would be a step forward if the manufacturers and users of measuring and controlling equipment would standardize on such a concept since it not only has a scientific basis, but is acceptable in the light of our usual understanding of accuracy.

Professor Jorissen applied the theory of errors, or statistics, to differential producers in much the same manner that we learned to apply it to measurements in our elementary engineering laboratory courses. You may recall such things as the most probable values of a series of measurements being the mean or average of that series of measurements. The residuals or deviations are then calculated as the difference between this mean value and each of the individual measurements. Using these residuals, it was possible to calculate a standard deviation for a series of measurements by squaring the deviations, adding them all up, dividing by the number of measurements, and then taking the square root. This is a well-known standard procedure and the formula for calculating this standard deviation may be written as:

$$\Delta = \sqrt{\sum_{i=1}^{n} \delta_i^2}$$

Now, if the distribution of errors follows the normal or Gaussian distribution, which all normal measurements do, the theory of errors teaches us that there is a probability of 68 per cent that the error of one measurement will not exceed the standard deviation and there is a probability of 95 per cent that the same error does not exceed twice the standard deviation.

Thus, once we have calculated or determined from tests this standard deviation, we can be pretty sure, 95 per cent sure, that the error of any one measurement will not exceed twice the standard deviation. This, in essence, was Dr. Jorissen's suggestion, i.e., that we define tolerance of a fluid meter as equal to

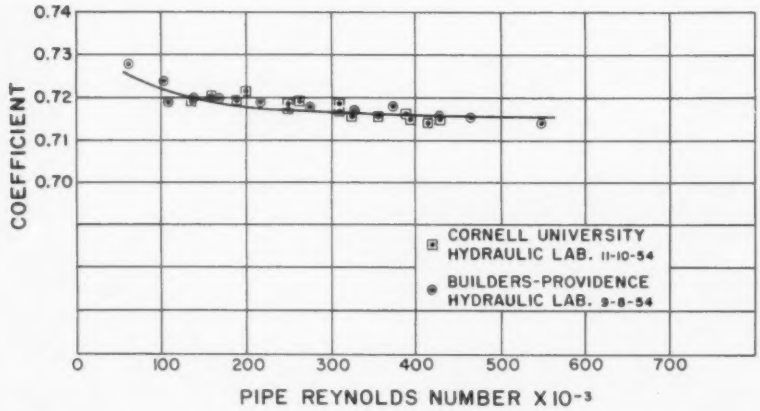


Fig. 8. Calibration of same tube in Builders-Providence laboratory and Cornell university laboratory.

DALL TUBE COEFFICIENT RECORD

SERIAL NO.	SIZE	WHERE CALIB.	B	C	C_m	$C-C_m$	δ	δ^2
28780	6.00 x 3.909"	B-P	.652	.690	.688	.002	.2906	.0845
29358	6.00 x 2.406"	B-P	.401	.7225	.7200	.0025	.3472	.1204
30633	6.00 x 3.909"	B-P	.652	.6900	.688	.0020	.2906	.0845
31260	6.00 x 3.908"	WPI	.652	.6920	.688	.004	.581	.338
1	8.00 x 5.85"	B-P	.7310	.669	.6628	.0062	.9350	.8740
2	8.00 x 5.85"	B-P	.7310	.662	.6628	.0008	.1207	.0146
5	8.00 x 4.397"	B-P	.5495	.710	.7048	.0052	.7380	.5450
28756	8.00 x 5.218"	B-P	.6523	.687	.688	.001	.1454	.0211
	8.00 x 5.217"	B-P	.6523	.686	.688	.002	.2906	.0845
	8.00 x 6.337"	B-P	.792	.632	.6285	.0035	.5570	.3100
30160	8.00 x 4.081"	B-P	.511	.714	.710	.004	.5630	.3170
	8.00 x 5.2165"	B-P	.652	.688	.688	.000	.000	.000
	8.00 x 6.338"	B-P & C.U.	.7195	.628	.628	.000	.000	.000
	8.00 x 4.080"	B-P & C.U.	.5100	.715	.710	.005	.7045	.4960
29193	10.00 x 4.015"	B-P	.4015	.7225	.720	.0025	.3472	.1205
29359	10.00 x 5.242"	B-P	.5242	.7048	.7082	.0034	.4800	.2300
29370	10.00 x 8.02"	B-P	.802	.6270	.622	.005	.8040	.6460
29237	11.933 x 6.327"	B-P	.530	.7055	.7074	.0019	.2686	.0720
29209	11.936 x 9.602"	B-P	.804	.6205	.6205	.000	.000	.000
29149	11.931 x 6.327"	B-P	.530	.709	.7073	.0023	.3250	.1055
29567	11.930 x 4.990"	B-P	.4175	.7150	.7190	.004	.5560	.3090
29585	11.934 x 9.600"	B-P	.804	.6228	.6203	.0025	.4030	.1623
29414	11.935 x 9.5975"	B-P	.803	.6190	.6204	.0014	.2258	.0510
29413	11.935 x 9.598"	B-P	.802	.621	.621	.000	.000	.000
29668	11.936 x 6.329"	B-P	.530	.707	.7072	.0002	.0283	.0008
29656	11.940 x 6.329"	B-P	.530	.705	.7072	.0022	.3110	.0966
29827	12.067 x 9.716"	B-P	.805	.6135	.6193	.0058	.9370	.8780
29828	12.048 x 9.717"	B-P	.806	.6185	.6190	.0005	.0875	.0065
28675	14.002 x 9.249"	B-P	.660	.689	.686	.003	.4375	.1913
31458	20.00 x 10.358"	C.U.	.518	.711	.709	.002	.2820	.0795
33157	21.12 x 15.70"	WPI	.744	.650	.657	.007	1.0500	1.1000
29243	24.025 x 17.544"	C.U.	.731	.661	.6627	.0017	.2565	.0657

$$\delta = \frac{C - C_m}{C_m} \times 100 \qquad \sigma = \sqrt{\frac{\sum_{i=1}^{n} \delta_i^2}{(n-1)}} = .4810 \qquad 2\sigma = 0.962$$

Fig. 9. Dall flow tube coefficient record.

twice the standard deviation. This gives us a quantity which is precisely defined and there can be no guess work nor judgment involved. Also, it is a value which, if misinterpreted in accordance with our usual understanding of tolerance or the idea of maximum error, will not lead us very far astray. There are only five chances out of 100 that the error might be greater than this quantity.

Although we are talking about primary metering devices, this same concept could be applied to all types of measuring equipment. To determine the tolerance to apply to a given instrument, it would be necessary to select at random several units and test them for standard deviation with a given input value. As long as the group of instruments was large enough, the tolerance could be calculated as being equal to twice the standard deviation.

We have applied this type of calculation to determine the tolerance to be used with the Dall flow tubes. Since most of our tests were made in the hydraulic laboratory of Builders-Providence Inc., it is important to get some idea of the accuracy of this laboratory. Perhaps the best way to do this is to check the results of some of the calibrations made in this laboratory to the calibration of the same tubes in other laboratories. *Fig. 7* does just this with an 8-in. tube which was calibrated first in the Builders-Providence laboratory and second in the laboratory of the University of Pennsylvania. The square points represent the University of Pennsylvania tests and the circle points represent tests in the Builders-Providence

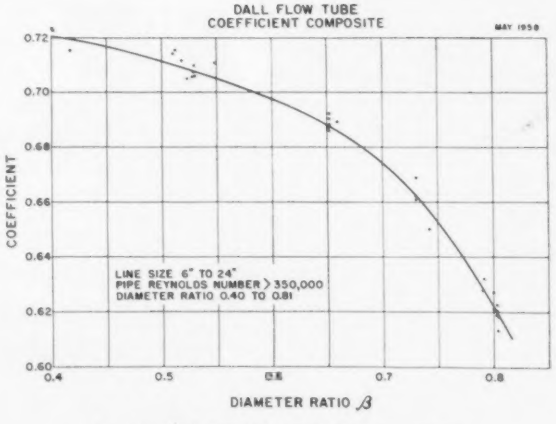
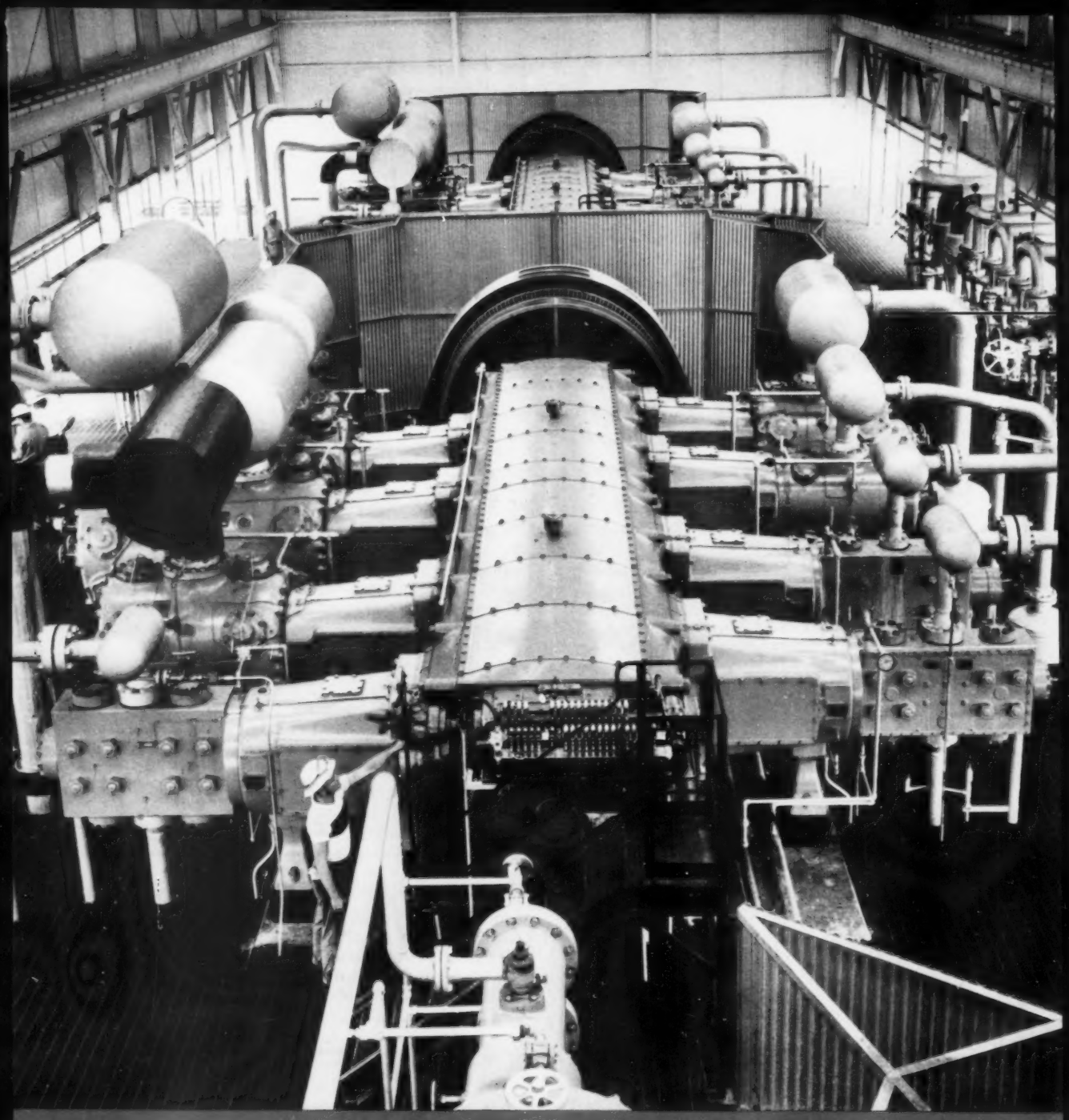


Fig. 10. Dall flow tube coefficient composite.



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This new Cooper-Bessemer-equipped Southern Nitrogen plant, constructed at a cost of $14 million, produces more than 250 tons of ammonium nitrate a day.

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In today's modern processing plants, multiple compressing requirements are often the rule. Here is how such needs are met...with two automatically controlled 5000 h.p. Cooper-Bessemer LM compressors . . . in Southern Nitrogen Company's new synthetic ammonia plant at Savannah, Georgia.

On each LM compressor, one bank of cylinders handles compression of the gas mixture in four stages to 5125 psi. In the second bank of cylinders, one cylinder compresses pure ammonia gas, while the remaining three cylinders compress a mixture of nitrogen, hydrogen and air in three stages to 150 psi for the reforming furnace.

Cooper-Bessemer process compressors, reciprocating *or* centrifugal, offer the modern flexibility, extreme availability and efficiency that add up to high volume processing with minimum machinery and attendance. To be sure your files contain complete information, send for the latest bulletin.

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ENGINE OR MOTOR DRIVEN

laboratory. The agreement is excellent.

Fig. 8 shows the comparison of an insert-type tube which was tested in the Builders-Providence laboratory and also in the hydraulic laboratory of Cornell university. Again, the agreement is excellent. Notice how the Dall flow tube has a coefficient curve somewhat similar to an orifice plate; that is, one which rises at low Reynolds numbers rather than decreasing like the Venturi tubes or flow nozzles.

Fig. 9 shows the calculation of the standard deviation for 32 Dall flow tubes ranging in size from 6 in. to 24 in. in diameter and ranging from .40 to .81 in diameter ratio. We have tabulated the tube serial number, its size and the value of coefficient after it has become constant at the higher Reynolds numbers. The best curve was then drawn through these points by eye and the coefficient for each diameter ratio tested were read from this curve (C_m). The deviations or residuals were calculated in per cent as $\frac{C_m - C}{C_m} \times 100$ and then the standard deviation calculated according to the formula shown. This standard deviation figure came to 0.496 per cent, or twice the standard deviation came to 0.98 per cent. Thus, based on these results, there is a 95 per cent chance that the Dall flow tube will measure the true flow within 1 per cent provided it is properly installed and the coefficient value is taken from the mean curve.

Fig. 10 shows this curve with the test points plotted on it. The largest deviation is about 1 per cent which is for a tube with about a 0.08 diameter ratio. These test points seem to cluster about certain diameter ratios. This is because they have been manufactured in standard sizes, but, of course, it is possible to have them made for any size.

Ref. 2 gives the results of many tests on the Dall flow tube and shows the effect of various disturbances upstream from this tube.

Thus, we have seen some facts about a new device which we do not attempt to understand, but which we can use. We have seen that it has a phenomenally low pressure loss for the differential that it develops and that it is capable of giving accurate measurements for flow accounting and control. ■

REFERENCES

1. "On the Evaluation of the Accuracy of the Coefficient of Discharge in the Basic Flow Measurement Equation," A. L. Jorissen, Transactions of the A.S.M.E., V. 75, October 1953.

2. "The Dall Flow Tube," I. O. Miner, Transactions of the A.S.M.E., V. 28, April 1956.

GAS Pipeline People

Gerald Pope
Beaird Co.

R. W. Rademacher
Beaird Co.

A. W. Foster
Consolidated

A. W. FOSTER is the newly appointed assistant system gas dispatcher of Consolidated Natural Gas Co., Clarksburg, W. Va. He was formerly with Hope Natural Gas Co. as superintendent, gas control. In his new post he has transferred to New York State Natural Gas Corp., but will continue to headquarter with Hope in Clarksburg.

KENNETH N. HOSTLER has been promoted to chief engineer at Ohio Fuel Gas Co.'s Weaver compressor station near Lucas, Ohio. He succeeds Merlin M. McInturf, who was named southern compressor division superintendent recently.

HAROLD A. JONES is now vice president and eastern manager for Motorola Communications & Electronics Inc. He had been the vice president in charge of the midwestern area. Mr. Jones replaces LOWELL E. WHITE, who will be working on special assignments for Arthur L. Reese, vice president and general manager. Succeeding Mr. Jones as midwestern manager is ROBERT N. SWIFT, who also was elected a vice president. Mr. Swift had been sales manager, special markets in the midwestern area.

GERALD POPE, assistant general sales manager since May 1957, has advanced to general manager of sales of the J. B. Beaird Co. Inc., Shreveport. Mr. Pope joined Beaird 11 years ago as a sales engineer. Beaird has opened a district office in New York. R. W. RADEMACHER, formerly manager of plant storage, has been promoted to manager of the eastern division and will be in charge of the New York office.

PHILIP OXLEY, New Orleans district geologist for Tennessee Gas Transmission Co., was promoted to district exploration manager at Lafayette, La. He is succeeded in the New Orleans post by JOHN T. VELKAS, former senior geologist in Lafayette. EUGENE E. MCELVANEY, New Orleans district landman, is now district exploration manager.

ROBERT S. WARREN has been appointed advertising manager of Cooper-Bessemer Corp., Mt. Vernon, Ohio. He succeeds the late EUGENE R. BONNIST. Mr. Warren, associated with Cooper-Bessemer's marketing activities for more than 14 years, will direct the company's advertising and sales promotion. He joined Cooper-Bessemer in 1945. Later he became associated with the Griswold-Eshleman advertising agency in Cleveland as account executive on the Cooper-Bessemer account and other industrial accounts.

Continued on page 172

GAS Magazine to publish A.G.A. convention newspaper

There will be several "firsts" at the 40th annual convention of the American Gas Association to be held this month (Oct. 13-15) by the bounding surf of Atlantic City's beachfront.

GAS Magazine will also produce an important "first." A new publication will be launched. As a service to our industry, GAS Magazine's A.G.A. Convention Daily newspaper will be "on the streets" each morning during the Atlantic City meeting. The purpose of the A.G.A. Convention Daily is to provide delegates with a source of gas industry and convention news blended with quick flashes of national and international coverage.

Editorial offices will be in GAS' City Room (Room No. 1, Georgia Street side, Convention Hall). GAS staff members will headquarter there. Publisher Frank Chapman, Editor Fred Ebdon, Managing Editor Don Wright, Eastern Editor Bill Clark, and Assistant Editor Barbara Hall will be on hand to write and edit the news.

The city room will be the focal point of the news-gathering facilities of GAS. In addition to the more conventional sources, news will be teletyped to our city desk 24 hours a day via United Press International news service. Chilton's Washington staff will be rushing in news from the nation's Capitol over a direct TWX wire to Eastern Editor Bill Clark's office in Chilton's building at nearby Philadelphia. The A.G.A. Convention Daily will be printed in that city. A private telephone (Atlantic City 5-0076) is installed to link the city room with GAS' Los Angeles facilities and with the nation.

Features will be a daily Washington "roundup" from Neil Regeimbal; a directory of the exhibits in the "Parade of Gas Progress" and other displays that will highlight the convention; a daily analysis of the latest regulatory trends by a top-flight authority; a daily financial analysis from Frank B. Smith, Editor-Analyst, "THE VALUE LINE Investment Survey," and others. Extensive on-the-spot pictorial coverage of the convention is also planned.

Publication of this convention newspaper is another project in GAS Magazine's policy of industry participation.

Previous industry participation projects conceived and produced under GAS sponsorship include a series of symposia on the use of electronic computers for gas industry engineering; the first demonstration of facsimile transmission over a gas-pipeline microwave system; publication and distribution of special research work; symposia on automation in gas system operations, etc.

Your friends at GAS Magazine sincerely invite everyone attending A.G.A.'s big Atlantic City convention to drop by our city room at any time (night or day) to visit with us and see a newspaper staff in action. And our newspaper is "open" to all; so write, wire or phone news, announcements, etc. (send pictures, too), to Room 1, Convention Hall, Atlantic City.

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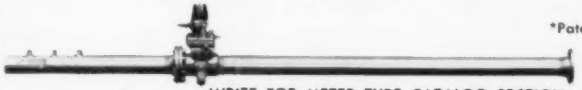

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110

pipeline people • *Cont'd.*

RALPH E. MULLIN, president of Westpan Hydrocarbon Co., Corpus Christi, Texas, has been elected to the board of directors of Colorado Interstate Gas Co., Colorado Springs.

New divisional heads have been named in a realignment of functions in general products sales by the J. B. Beaird Co., Inc., Shreveport. Operations of the special products division and the storage and contract section have been combined under J. S. RICHEY, who is now manager of contract sales. Storage and contract sales formerly were directed by R. W. RADEMACHER, who has been promoted to manager of Beaird's new eastern division with headquarters in New York. JOHN HENDRYX has been promoted from product manager to manager of compressor sales.

BENJAMIN H. COOKSEY JR. has been promoted to manager of the gas measurement section of the operating department of Hope Natural Gas Co., Clarksburg, W. Va. He succeeds CHARLES G. MOORHEAD, who is retiring. Mr. Cooksey has been with Hope since 1946 when he joined the company as a civil engineer. Since 1956 he has been superintendent of gas measurement in charge of field operations.

Tennessee Gas Transmission Co., Houston, has promoted two of its oil and gas exploration personnel in the Rocky Mountain area. JOE M. WOLFE is now assistant division exploration manager. He has transferred to the Rocky Mountain division headquarters in Denver. Succeeding Wolfe as district exploration manager at Casper, Wyo. is CARL E. JENKINS, who has been serving as district geologist in Casper. ROBERT L. SIELAFF is division exploration manager at Denver.

GUINN T. WILLIAMSON, former chief engineer at Tuloma Builders, Tulsa, has been elected vice president. He will be in charge of engineering sales and process development. DICK R. TURNER is now Tuloma Builders' manager of engineers. He will have charge of all of Tuloma's engineering, design and material procurement for both the construction company and pipe fabrication shop.

SHERMAN R. STRONG is heading up a new section of the employee relations department of Texas Eastern Transmission Corp. As assistant director of employee relations, Strong will be in charge of employee relations activities for Texas Eastern divisions based in Houston, his headquarters. Prior to his recent appointment, Strong was personnel director of Texas Eastern's wholly owned subsidiary, La Gloria Oil & Gas Co.

MILLS COX has been named president and chief executive officer of Transwestern Pipeline Co., Houston. He has been serving as executive vice president.

HOWARD S. BEAN has been retained as consultant on flow measurement by the Foxboro Co., Foxboro, Mass. Mr. Bean was formerly with the National Bureau of Standards where he served for 28 years as chief of the gas measuring instruments section. For the past 10, until his recent retirement, he was chief of the capacity, density, and fluid meters section. His association memberships include several committees of the AGA and ASME, among them the ASME research committee on fluid meters (since 1930) and the AGA gas measurement committee (since 1927).

CHARLES A. CONE has been elected president of the recently organized Oil States Engineering Co., Tulsa. Mr. Cone formerly was associated with Dresser Engineering Co. where he served as vice president. W. G. STOREY is vice president of the new company which designs and erects pumping stations, gas compressor stations, and gas products plants. A. C. YOUNG, secretary-treasurer of Oil States, formerly was chief mechanical engineer for Dresser Engineering Co.

Ralph Mullin
CIG

B. H. Cooksey, Jr.
Hope Natural

Howard S. Bean
Foxboro

Charles A. Cone
Oil States

G. T. Williamson
Tuloma

Dick Turner
Tuloma

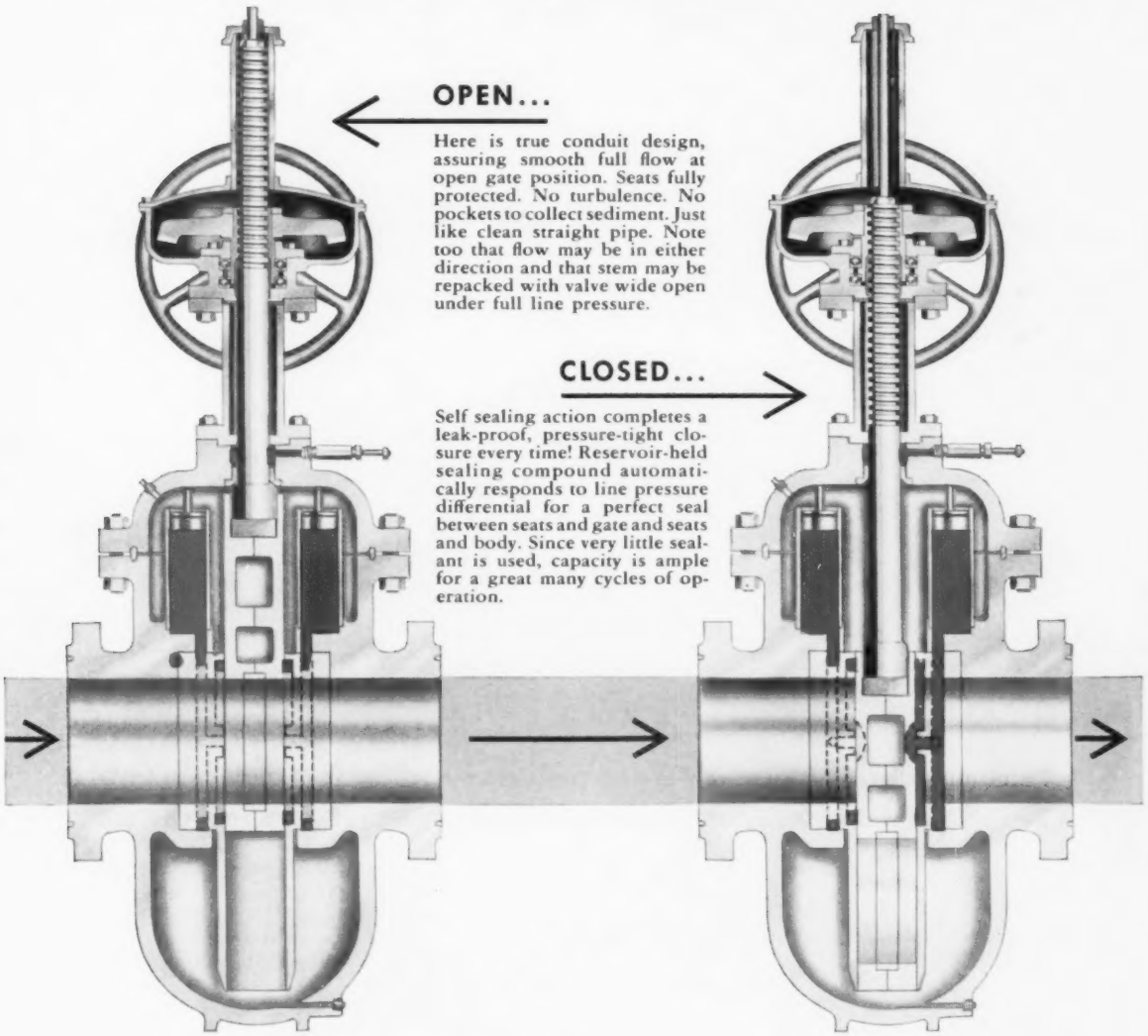
DANA M. NORTON is the newly elected vice president of industrial relations for Ohio Injector Co., Wadsworth, Ohio. He formerly served as director of industrial relations for Curtiss-Wright Corp. in Utica, Mich.

Panhandle Eastern Pipe Line Co. has announced supervisory changes in the pipeline section. STANLEY T. SMITH, assistant superintendent at Paola, Kan. moved to Ople, Kan. as district superintendent. He replaces W. E. RIGSBY, who is retiring. W. L. WOOD replaces Smith at Paola as assistant superintendent. J. B. WALTERS, who has been regional clerk at Paola, succeeds Wood as assistant superintendent at Houstonia, Mo.

BEN S. SMITH JR. has joined the Murphy Corp. as director of services. In the newly created post, Mr. Smith will centralize the general service functions performed for the benefit of the parent company and its affiliates.

It's an "Open and Shut" case for...

DARLING-McEVOY CONDUIT GATE VALVES



OPEN...

Here is true conduit design, assuring smooth full flow at open gate position. Seats fully protected. No turbulence. No pockets to collect sediment. Just like clean straight pipe. Note too that flow may be in either direction and that stem may be repacked with valve wide open under full line pressure.

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Self sealing action completes a leak-proof, pressure-tight closure every time! Reservoir-held sealing compound automatically responds to line pressure differential for a perfect seal between seats and gate and seats and body. Since very little sealant is used, capacity is ample for a great many cycles of operation.

THESE and other features combine to make Darling-McEvoy conduit gate valves unique and unmatched in pipe line service today. They are now available in 4" and larger sizes, fully field proved, with experience a matter of record on various major lines. For detailed information ask for Bulletin 5402.

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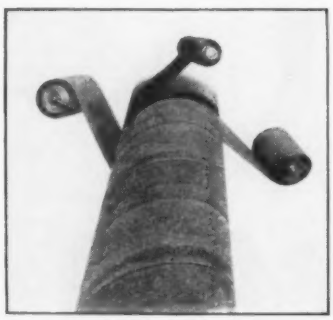
Pipeliners discover this time-tested protective coating (polyethylene tape by Polyken) goes on faster... with less labor... and racks up real savings



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Strong, durable Polyken tape *(black spool)* is made of remarkably inert polyethylene . . . resistant to the corrosive effects of moisture, soil chemicals and electrolytic current.

Two examples of modern transportation—superhighway and pipeline—one aboveground, the other below.

But pipe goes places where roads are never seen. Through wooded wilderness . . . across frozen wastes . . . under broiling desert sands.

Polyken adhesive tape coating helps to make the going easier. It requires no primer, no hot dope preparation, no cooling or drying time. Wraps on cleanly, quickly . . . allows pipe to be buried immediately.

Crews are small (about half the size of hot dope crews). Labor costs are low . . . so are handling and equipment costs. And construction efficiency is amazingly high.

Polyken is the tape of experience with a long record of actual use in protective coating. For further information contact the Polyken Sales Division, 309 W. Jackson Blvd., Chicago 6, Illinois. Dept. PE-3.

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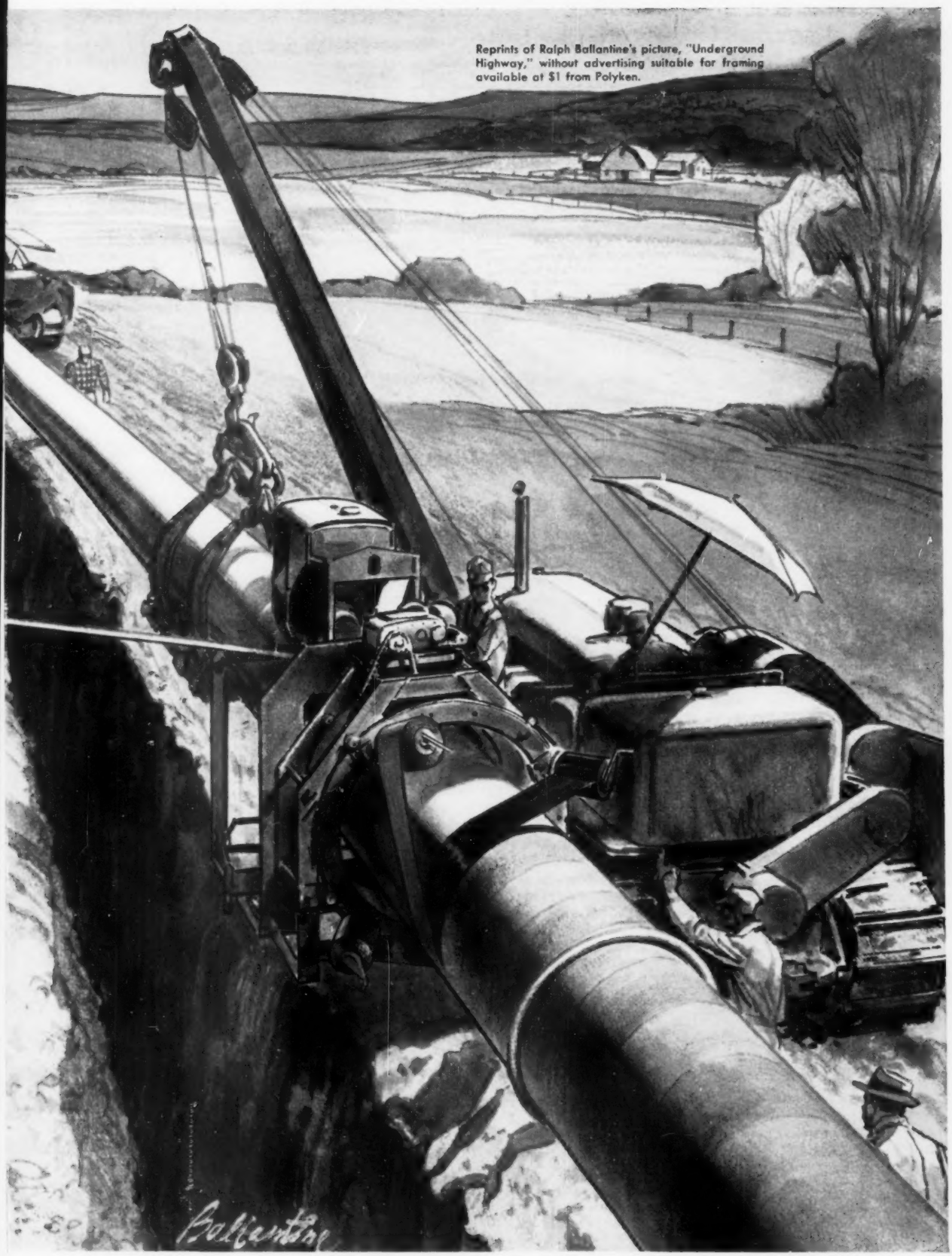


Reprints of Ralph Ballantine's picture, "Underground Highway," without advertising suitable for framing available at $1 from Polyken.

GAS • PIPELINE NEWS

Transco goes into action with FPC okay in hand

Early in September the FPC gave the go-ahead signal to Transcontinental Gas Pipe Line Corp.'s $167 million expansion plan. Included in the okay of Dockets G-13143 et al and G-13169 et al is the development of storage fields in northern Pennsylvania to serve markets along the Atlantic Seaboard.

Transco's E. Clyde McGraw expects his company to meet its commitments for increased gas deliveries this winter to the New York City-New Jersey-Philadelphia metropolitan area and to customers in the South now that the certificate has been issued.

When the signal was given, heavy equipment and men swung into action. Contracts on key phases of the extensive program were let months ago. Men and materials were at construction sites along the Eastern Seaboard and in the Deep South. Pipe was waiting in temporary yards along the system.

The authorization covers four applications by Transco, one of which was filed jointly with Texas Eastern Transmission Corp. and New York State Natural Gas Corp. Also covered were applications of 26 producers to sell gas to Transco. The joint application involves development and operation of the Leidy field and eventually the Tamarack field in Potter and Clinton counties, Pa., for underground storage.

The largest project covers construction by Transco of some 556 miles of transmission line, 38,580 hp in compressor capacity, and about 345 miles of purchase laterals. Transco will use these facilities to sell an additional 173,899 Mcf daily to 28 existing customers and to store 191 MMcf daily in the Leidy field for 10 existing customers.

When the new work is in operation, Transco will have completed looping its system from the Gulf Coast to New York.

In the New York City-New Jersey-Philadelphia area alone, Transco has commitments this winter for an increase in daily allocations of 190 MMcf. This area already has present daily allocations of 669 MMcf plus 136 MMcf on peak days from Transco's present storage. For the entire Transco system, plans call for increasing daily allocated capacity from 953 MMcf to 1.1 billion, plus an increase from 136 million to 340 million of storage capacity.

FPC's Hall denies Michigan Wisconsin plan

A recent filing from FPC Presiding Examiner Hall denied Michigan Wisconsin Pipe Line Co.'s application to expand its system to serve 10 distributing companies proposing new service in 29 communities in Wisconsin and one in Michigan (Dockets G-2306, 2327, and 9850).

The decision held that the evidence presented by Michigan Wisconsin did not meet the requirements of the comparative hearing ordered by the commission; that Michigan Wisconsin had "failed to establish that it is able properly to do the acts and perform the service proposed"; and that its "proposed facilities and operation are not shown to be economically feasible." The $32.2 million project covered 621 miles of pipeline and 14,280 hp in compressor station capacity.

Nine of the 10 distributors covered in Michigan Wisconsin's filing also are proposed to be served by Midwestern Gas Transmission.

Since hearings in the Midwestern case were concluded last January, Examiner Hall has filed five separate decisions disposing of a total of 11 of the 20 applications. He has not yet ruled on Midwestern's proposals.

In turning down Michigan Wisconsin, Examiner Hall said that the American Natural Gas System was simultaneously (1) attempting to cause Panhandle Eastern Pipe Line Co. to meet the Midwest needs of its system by increasing its capacity rather than by abandoning service to American Natural and redistributing the gas involved in the abandonment to Panhandle's customers; (2) "strenuously resisting" Midwestern's efforts to construct a new pipeline to serve markets in the Midwest; (3) showing a need for additional gas on its own system; and (4) seeking and obtaining additional FPC authorizations in an effort to meet its own system demands.

He said that while this strategy was undoubtedly designed to protect the American Natural system's own private interest and control markets to its own advantage, "there is no escape from the conclusion that there is a serious shortage of gas in the Midwest areas served by Panhandle and the American Natural System, and that the efforts of some distributors seeking natural gas from them for service to existing and new markets are being, and have been, completely frustrated."

Westcoast completes new gathering system

Westcoast Transmission Co. Ltd.'s gas gathering system northwest of Fort St. John, B. C., was completed ahead of schedule.

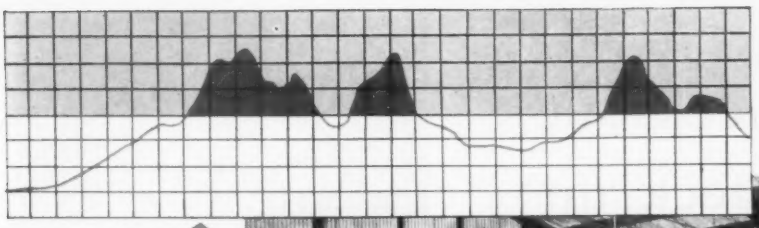
The new lines, which bring the total length of Westcoast's gathering system to 240 miles, tie in 21 more gas wells to the grid terminating at Taylor, on the banks of the Peace river near Fort St. John. At that point, Westcoast's 650-mile mainline to southern British Columbia and the U. S. border begins.

When the 21 new gas wells are all tied in late in 1958, an estimated 80 MMcf daily more gas from British Columbia fields will be delivered to the McMahon plant at Taylor, which processes the sour gas into motor fuels, sulfur and residue pipeline gas. Ultimately the extension will add 150 MMcf daily to the gathering system's capacity.

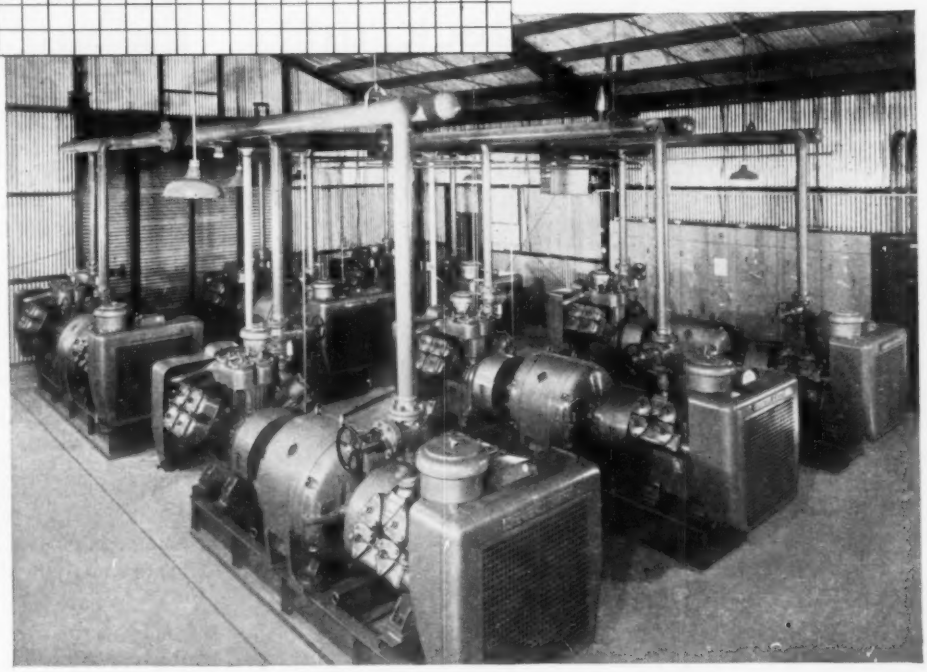
New FPC map issued

The FPC's June 30, 1958, revision of its map of "Major Natural Gas Pipelines" has been issued. The five-color, 13-18 in. map shows major existing pipelines, those under construction, those authorized but not started, and proposed lines which are pending FPC action.

Existing or proposed pipeline systems of 127 companies are represented. In addition, the map shows natural gas fields, indicating both major souces and generalized areas of supply.



Whenever daily or seasonal load peaks exceed the capacity of its natural gas pipeline, Iowa Power and Light Co. meets the extra demand with its own propane-air mixing plant.



These six 250-hp twin-mounted Ingersoll-Rand Type 40 compressors deliver 125-psi air to the propane-air mixer. Note the wide flexibility of production made possible by this number of double units.

How Iowa Power & Light Company

SHAVES GAS LOAD PEAKS

with a 1500-hp assist from Ingersoll-Rand air-cooled compressors

"Peak shaving" is a big money saver—to both the consumer and the supplier. By providing reserve capacity to meet load peaks, it avoids high pipeline demand rates or costly construction for additional pipeline capacity.

The Iowa Power and Light Company has solved this problem very efficiently at its Des Moines station, by the addition of a propane-air mixing plant which can produce more than 18 million cubic feet per day. Designed and built by Draketown (Drake and Townsend, Inc.), this plant produces a mixture of 54 percent propane and 46 percent air; the resultant mixture has approximately the same physical properties as 1000-btu natural gas, but has a higher heat value (1350 btu).

Air for the mixing plant is provided by six double-mounted Ingersoll-Rand Type 40 compressors, each consisting of two 125-hp units coupled to a single 250-hp motor between them. These air-cooled compressors were selected due to their low space requirement and the flexibility inherent to such a combination. The installation has a total capacity of 6600 cfm—enough to produce 18,700,000 cubic feet of gas mixture per day to the distribution lines.

Type 40 compressors are completely self-contained, two-stage air-cooled units. They are available from 25 to 125 hp with flange-mounted, coupled or belted motor drive. For more information on these and other Ingersoll-Rand compressors, call your I-R representative or write direct.

Only I-R compressors have CHANNEL VALVES
Known for high efficiency, quiet operation and exceptional durability. Entirely different. Each valve is a combination of straight-lifting stainless-steel channels and leaf springs, with trapped-air spaces which cushion action, prevent impact.

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This test pilot of ours has checked out every new design we've had in the last two years. His business is finding answers to questions. But last week he asked *us* one.

"Why can't we rig it so I can buy U. S. Savings Bonds out of my salary, automatically?" he asked. "I want to save, but I keep forgetting about it."

We told him, of course, that we've had Payroll Savings for years. Within minutes his card was signed and he was brought into the Plan. Then we decided to check up and see how many other people on our staff had never heard about the Plan. There were quite a few.

A telephone call to our State Savings Bond Director was all we needed. He supplied us with the latest booklets, folders and forms. Then he conducted a survey straight through our company and put an application blank in the hands of every single employee.

There wasn't a bit of pressure about this information campaign, but the way our people responded was inspiring. They proved that the average American wants the fine investment security that U. S. Savings Bonds provide.

Today there are more Payroll savers than ever before in peacetime. Your State Director will be happy to help you install a Payroll Savings Plan or build enrollment in one already existing. Look him up in the phone book or write: Savings Bonds Division, U. S. Treasury Dept., Washington, D. C.

GAS

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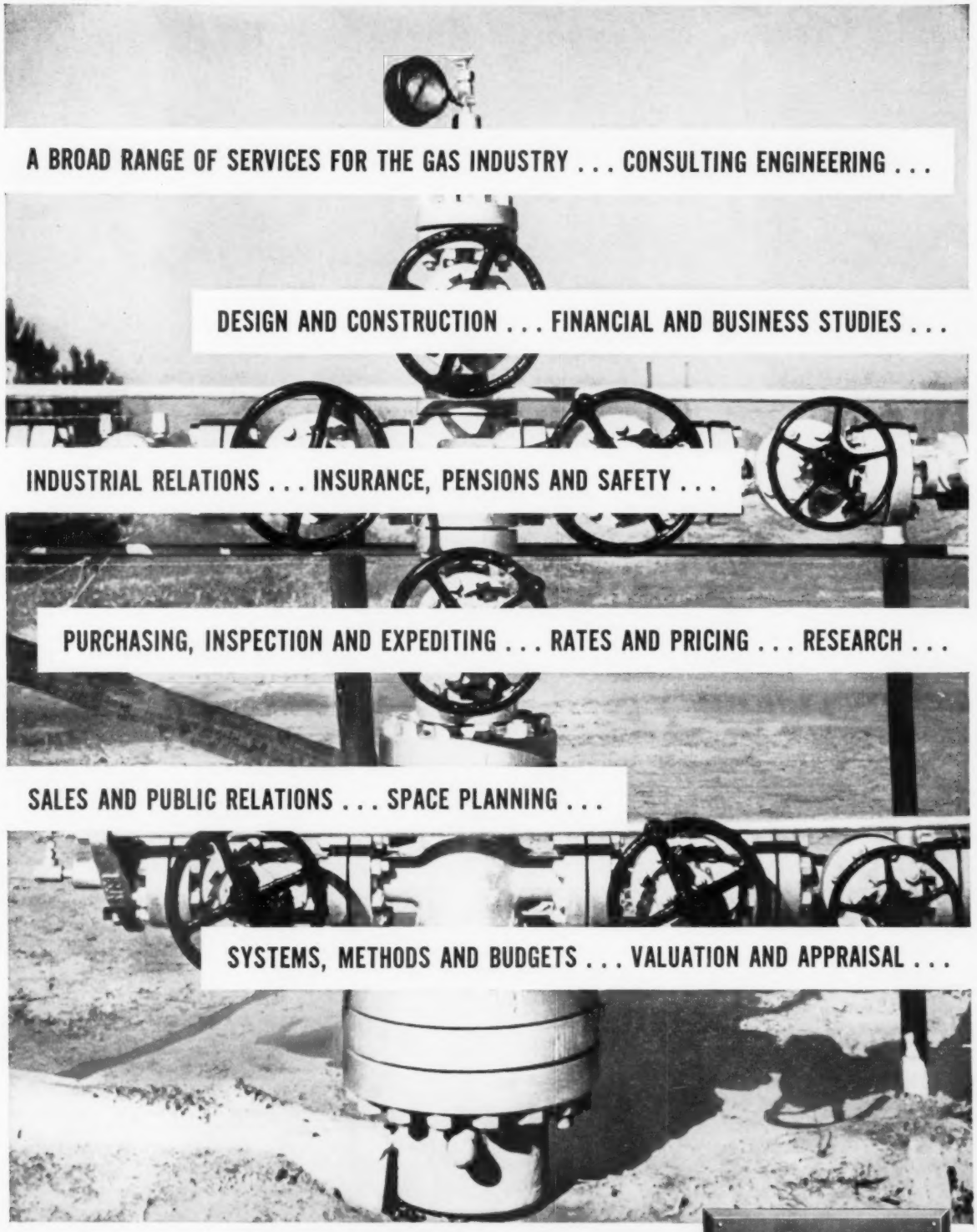
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Peter Flagg (left), president of C. N. Flagg & Co. construction firm, and Clifford B. Ewart, president of Tidewater Natural Gas Co., Wilmington, N. C., sign contract calling for installation of 200 miles of lateral and city distribution pipelines to introduce natural gas to five-city region in North Carolina.

Welding book published

Section II of the fourth edition of the "Welding Handbook, Gas, Arc & Resistance Welding Processes" has been published by the American Welding Society, 33 W. 39th St., New York 18.

Section II contains 13 chapters, each with a comprehensive bibliography and each with its own table of contents.

The Welding Handbook has been divided into five sections. One section will be published each year. When the five-volume edition has been completed, Section I will be revised again. As a result of this new concept in handbook publishing, up-to-date information on welding will be available each year.

Consumers Power makes plans for Trunkline gas

To pick up the gas it expects from Trunkline Gas Co. (GAS, August, p. 8), Consumers Power Co. plans to spend some $17.6 million on pipelines and a compressor station.

The Jackson, Mich., company proposes to build pipeline facilities extending 141 miles from the Indiana state line to interconnections with its Michigan facilities.

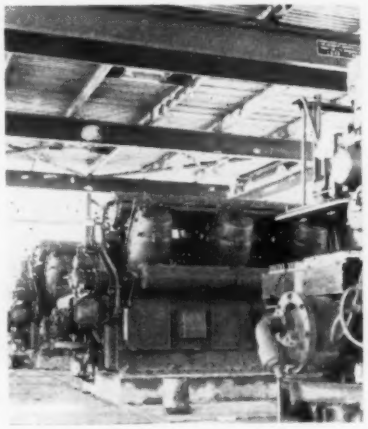
The Trunkline agreement calls for the transmission company to deliver to Consumers 100 MMcf of gas daily, commencing Oct. 1, 1959, with deliveries increasing by 25 MMcf daily on Oct. 1 of each of the four succeeding years.

Trans-Canada moves ahead despite tough going

Despite unusually wet weather and the anticipated slow going through the rock and muskeg, construction on the 853-mile final link in the Trans-Canada pipeline from Alberta to Montreal is moving on schedule.

In the muskeg country, contractors had to devise special methods of beating the sometimes bottomless mire. Miles of corduroy or riprap roads of planks and tree boughs were built on the right-of-way, and sections of pipe have been welded, cleaned, primed, coated and wrapped on "dry land" and pushed into the ditch. On one occasion outboard - motor - equipped pontoons were used as barges to move through lake-like ROW.

Timber and rock typify much of the terrain through which Trans-Canada's line is moving. This photo, near Bernard Lake in Northern Ontario, shows the pipe gang making initial welds in the 30-in. pipe beside the rock ditch through a heavy stand of timber.



The North Bay, Ont. compressor station is one of six stations being built this year for Trans-Canada Pipe Lines. Here three 1700-hp engines, using natural gas for fuel, have been installed to provide pressure boosting needed for initial flows. Three of the compressor stations are being built in Saskatchewan, one in Manitoba, and one by Northern Ontario Pipe Line Crown Corp. at Lakehead. Cost of the stations averages $3 million each.

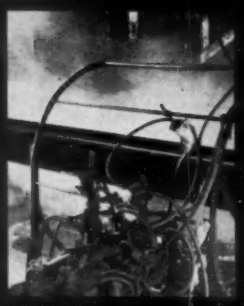
Steel firm sale denied

FPC presiding examiner Francis L. Hall has denied an application by Natural Gas Pipeline Co. of America to serve two Chicago-area steel firms with natural gas (Dockets G-9966, et al).

Examiner Hall said NGPL no longer has a gas supply sufficient to sustain its application. The gas supply for the expansion program was to come principally from the purchase of 460 MMcf daily from Colorado Interstate Gas Co. This proposal has been supplanted by the plans of Colorado Interstate and El Paso Natural Gas Co. (GAS, September, p. 112).

System expansion planned by Pioneer Natural

Pioneer Natural Gas Co., Amarillo, Texas, will build 62 miles of 10-in. transmission line, 20 miles of gathering lines, and a 4000-hp compressor station under its new



Now, lay coated pipe without "Special" handling

ABOVE: 16-inch pipe being spray-coated for use in new Transcontinental Gas Pipe Line Corp. gas-gathering system near Tilden, Texas.

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$4.5 million expansion project.

The line will be built from near Pampa in Gray county, Texas to connect with Pioneer's main transmission system in Randall county.

C. I. Wall, Pioneer president, said the new line will add more than 25 MMcf per day to his company's system. It also will connect the cities of Pampa and Panhandle to Pioneer's main transmission system. In addition, the new line will add to the gas supply for Amarillo and the entire west Texas area served by Pioneer.

PG&E completes Humboldt county expansion

Large quantities of gas are flowing through Pacific Gas & Electric's latest local development in Humboldt county, Calif. Completed and placed in operation was the San Francisco-based company's $11.5 million line extending 163 miles from Corning, crossing rugged mountains en route.

With completion of the new line, Humboldt county has a natural gas supply of 21 MMcf a day, the line's initial carrying capacity. The line, operating at 750 psig, traverses a route running from Red Bluff to Fortuna, Fernbridge, Loleta and Eureka. It will be extended soon to Arcata.

Southern Natural gets temporary certificate

Southern Natural Gas Co., Birmingham, got its requested temporary certificate (GAS, August, p. 144) for a $28.7 million construction job in Louisiana, Mississippi, Alabama and Georgia (Docket G-14587).

Construction authorized includes 224 miles of 24-in. mainline loops; 46 miles of 20-in. loops; 40 miles of 14-in. loops; about 53 miles of branch line loops; four 16-in. river crossings; 9 miles of field laterals; additional compressor capacity; and 2 metering stations. The new facilities assure additional firm deliveries to existing customers during the 1958-59 winter.

Over a two-and-a-half year period, Southern proposes to build 461 miles of 16- to 24-in. mainline loops; 62 miles of 14-in. branch lines; 53 miles of branch lines; 212 miles of field lines; 12,254 hp in additional compressor capacity; 12 river crossings; 8 purchase meter stations; and appurtenant facilities. Total cost of the project is $64.4 million.

Manufacturers abandoning Ohio retail sales

Manufacturers Light & Heat Co., Pittsburgh, is taking another step in the drawn-out realignment of Columbia Gas System.

In Docket G-14691, Manufacturers proposes to abandon its retail gas sales in Ohio and deliver gas at wholesale to its affiliate, Ohio Valley Gas Co., Columbus, for resale to Manufacturers present retail customers.

Under the plan, Manufacturers' interstate operations would remain subject to FPC jurisdiction and the Ohio retail sales would be made by Ohio Valley, subject only to the jurisdiction of the Ohio Public Utilities Commission.

Canadian gas consumers oppose central control

Canadian natural gas consumers are opposing any control of natural gas by that country's central government, including any restrictions on export of Canadian gas to the U. S.

At the same time, U. S. coal industry spokesmen, representing both management and labor, are demanding that the Canadian government block the flow of gas into this country.

The Province of Manitoba has urged the Canadian Royal Commission on Energy (Borden Commission), studying natural resources, not to place restrictions on production or export of natural gas. Manitoba officials say they fear that government actions which tend to restrict production would mean higher prices to Canadian gas consumers.

As long as there are sufficient reserves for Canadian consumption, there should be no control over production or export, the Manitoba government says, so that the price to consumers would seek a competitive level.

The Manitoba government also points out that possible future development of atomic electric power, and even solar energy, may some day upset the values of the fossil fuels, including gas. Thus, full development should be permitted now, the officials argue.

Coal warrior John L. Lewis, venerable chief of the United Mine Workers, and Frank F. Kolbe, president of the U. S. National Coal Association, both got into the act. In telegrams to the Borden Commission, they demanded that Canadian gas be excluded from this country.

The UMW union is "unalterably opposed to the importation of unemployment into the United States in the form of natural gas from Canada," the white-haired Lewis protested.

Mr. Kolbe went further. The Borden Commission's decision on exports can "seriously affect not only the U. S. coal industry, but Canada's economic welfare and future relations between the countries," the management spokesman said.

Cooper-Bessemer acquires Houston manufacturer

Creole Engineering Inc., Houston, has been acquired by Cooper-Bessemer Corp., Mount Vernon, Ohio, as a wholly owned manufacturing and engineering subsidiary.

Heading the new subsidiary as president is T. E. Kraner, formerly district manager of Cooper-Bessemer's Caracas, Venezuela, office and more recently of the New Orleans office.

Initial engineering and construction in Houston will concentrate on the completely packaged, pre-piped gas engine compressors.

E. L. Miller, president and general manager of the parent company, states that this new operation will set a precedent as the first wholly owned manufacturing subsidiary to be established in the heart of the oil country for the manufacture of products for the gas-gathering industry.

ALG signs supply contract with Arkansas Power

Arkansas Louisiana Gas Co. has a contract with Arkansas Power & Light Co. calling for delivery of up to 75 MMcf of gas daily to the AP&L steam generating station being built near Helena, Ark.

The 15-year contract, subject to approval of federal and state regulatory bodies, sets a starting price of 25 cents per Mcf and establishes a rising price scale over the life of the contract. B. E. Harrell, ALG vice president for gas supply,

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said that the average price of gas over the life of the contract will be lower than the present average price received from industrial gas users on the Arkansas Louisiana lines.

ALG will build a new pipeline from its Perla station near Malvern to Helena.

Texas Eastern's Lebanon terminal in operation

H. M. McDonald, vice president and general manager of the Little Big Inch Division, Texas Eastern Transmission Corp., turned a valve in Lebanon, Ohio, recently which let petroleum products from the Little Big Inch flow into Texas Eastern's new Lebanon Terminal —officially signaling the conversion of the 1700-mile pipeline from natural gas to products.

The 20-in. pipeline had been used for transporting natural gas from the Gulf state fields to the Midwest since converted from crude service to natural by Texas Eastern in 1947. The firm bought both the Little Big Inch and the Big Inch from the government in 1946 following their wartime use as crude lines.

Permission to remove the Little Big Inch from natural gas service so that it could be reconverted to a common carrier of petroleum products was granted to the Shreveport headquartered company by the FPC in January of this year. The pipeline division of the firm has just moved to Houston.

A new 14-in. lateral has been added to the original 20-in. system. The lateral takes off at Seymour, Ind., and travels northwestward to Chicago. In addition, in 1953 Texas Eastern purchased all of the facilities of Triangle Pipeline Co., a petroleum products pipeline serving refining centers in east Texas, north Louisiana, and south Arkansas.

In addition to product storage along the way and at the Lebanon terminal, Texas Eastern is constructing a 12-million-gal. underground storage cavern for L. P. gas at Middletown, Ohio, a few miles from the Lebanon terminal which is 30 miles northeast of Cincinnati.

Millard K. Neptune, senior vice president of Texas Eastern, headed a special dedication ceremony in Lebanon which included Capt. M. V. Carson, head of the Oil & Gas Division, Department of the Interior.

The company continues to operate the 24-in. Big Inch line in natural gas service which is a part of its more than 6000-mile natural gas pipeline network.

FPC approves gas supply settlement

The three-year-old dispute between Texas Illinois Natural Gas Pipeline Co. and 14 independent producers has been settled with FPC blessing (Docket G-6810, et al).

The controversy started in January 1955 when the 14 producers, which sell gas to Texas Illinois from Texas fields, tried to cancel their contracts under so-called escape clauses which provided for cancellation if the FPC attempted to regulate the producers.

The FPC ruled the producers come under the Natural Gas Act and could not cancel their contracts without the commission's approval. The producers took the case to court but then decided to settle out of court.

The FPC said the agreement continues the disputed contracts and makes available to Texas Illinois a larger quantity of gas over an extended period of time.

Texas-Florida line financing under way

Houston Corp.'s multi-million dollar financing plan covering its Texas-to-Florida pipeline is under way. Public offering of $36,188,000 of 5 per cent subordinated debentures due in 10 years and 1,809,400 shares of common stock was made by Blythe & Co., Inc., Lehman Brothers, Allen & Co. and Scharff & Jones Inc.

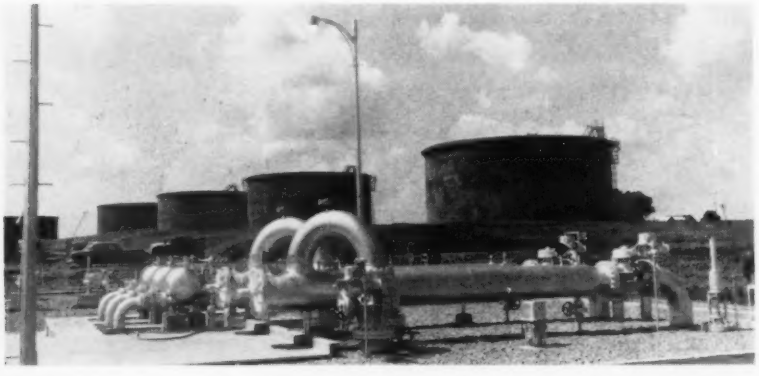
Each unit consists of $100 debentures and five shares of common stock. Price per unit is $150. The company also is selling at $10 per share, through rights to its present shareholders, 818,333 shares of common stock and 575,869 shares of class A stock.

Houston's pipeline subsidiaries, Coastal Transmission Corp. and Houston Texas Gas & Oil Corp., are selling at par to institutional investors an aggregate of $107.4 million principal amount of first mortgage pipeline bonds, 5½ per cent series due 1979.

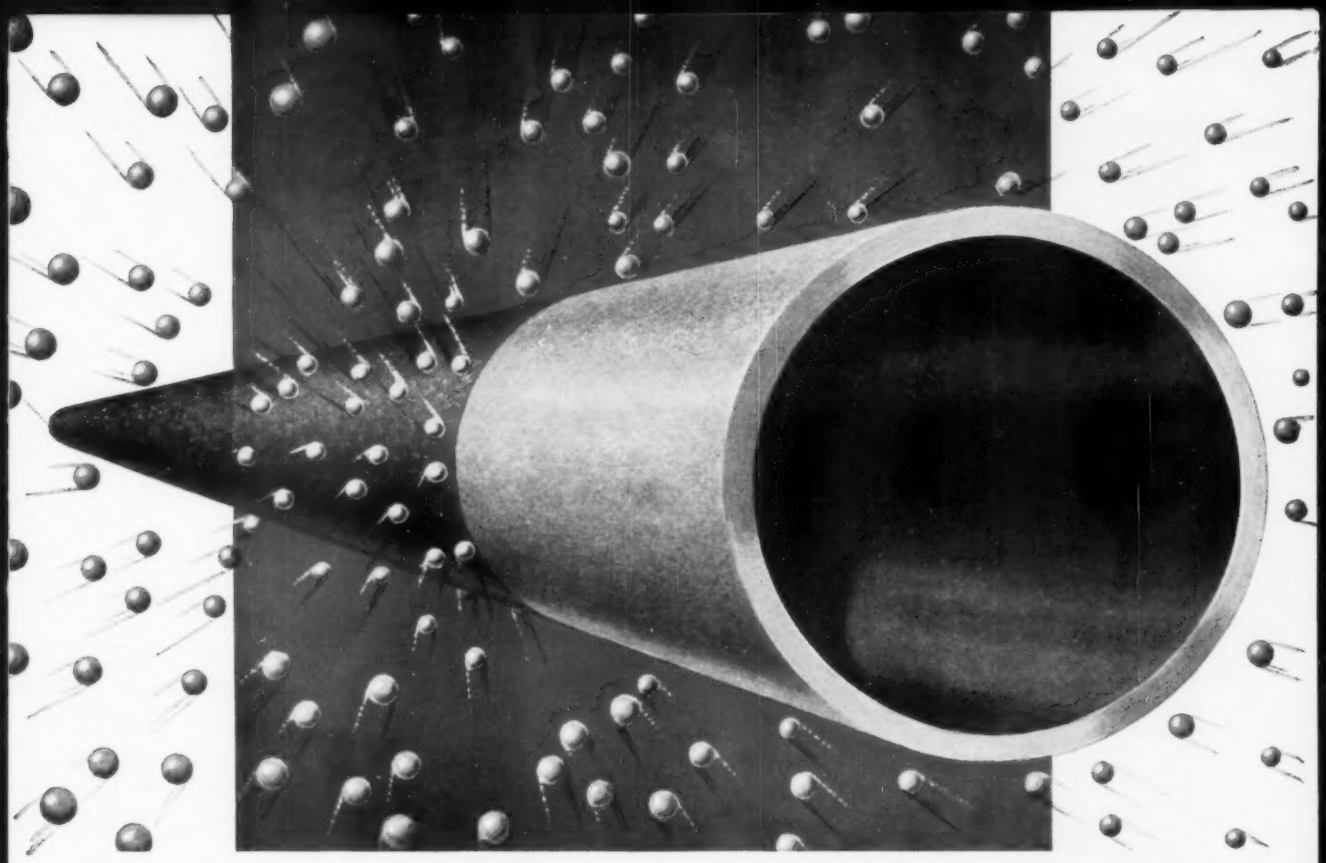
These are the principal steps in the financing program designed to provide capital funds for the 1500-mile natural gas system extending from the Gulf coast producing areas of Texas and Louisiana to markets in Peninsular Florida.

The initial pipeline system will have a daily average delivery capacity to the Florida markets of about 282 MMcf. It is designed for expansion with additional compressor facilities to a daily average delivery of approximately 411

Continued on page 190



Dedication ceremonies marked the opening of Texas Eastern Transmission Corp.'s Lebanon (Ohio) terminal for petroleum products shown here.



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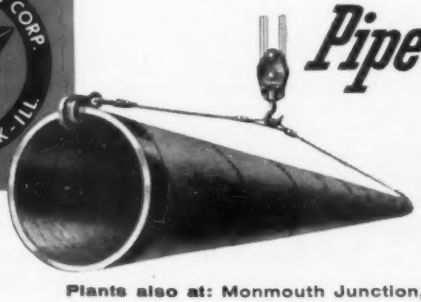

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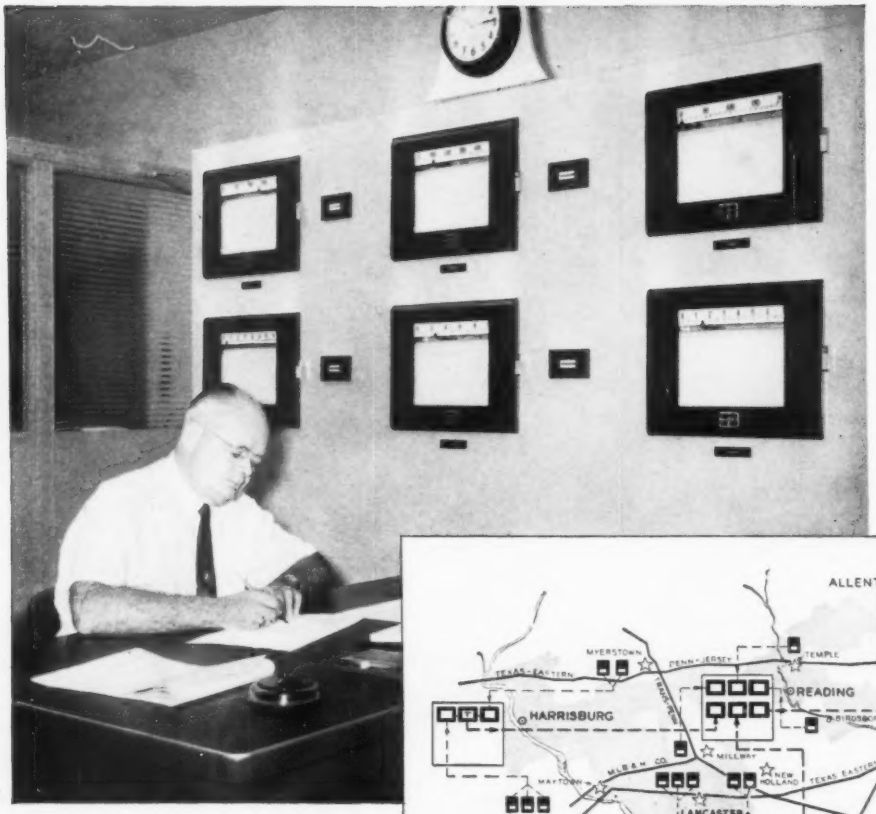
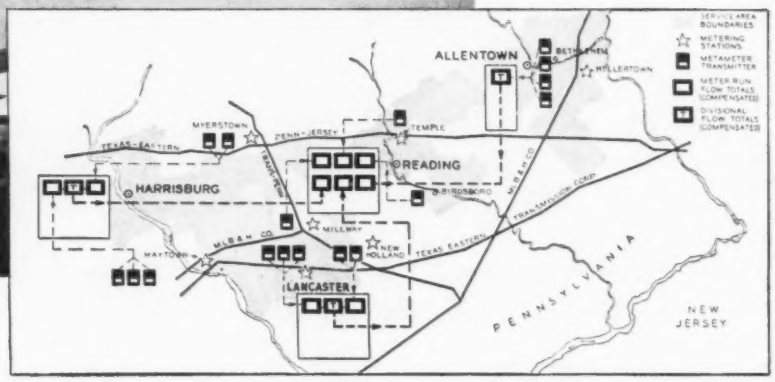


THE BRISTOL METAMETER* computer at United Gas Improvement Company continuously monitors this gas distribution network, automatically totalizes and corrects flow, and transmits results to central dispatching office at Reading, Pa.
*T. M. Reg. U. S. Pat. Off.



BRAIN 60 MILES LONG

computes for this dispatcher

Bristol computing telemeters give gas dispatcher instant, continuous, fully-corrected gas flow values

The instruments you see above are the readout end of a new Bristol computing telemeter system. They're installed at the Reading, Pa., headquarters of United Gas Improvement Company, whose natural gas distribution network serves the areas around Reading, Harrisburg, Lancaster, and Allentown, Pa. (See map.)

In seconds, the Bristol computing telemeters provide the gas dispatcher with integrated total flow values it used to take him hours to get—if at all. And the readings are fully and automatically corrected for factors like pressure, temperature, supercompressability and specific gravity. In fact, the continuously computed readings have generally agreed with the gas vendor's billing meter totals far more closely than the specified 1.5% accuracy.

Find out how a Bristol computing telemetering system can eliminate slide-rule work, information delays and uncertainties from your distribution system for natural gas or any other fluid, whether it covers miles or only a few hundred yards. Write: The Bristol Company, 119 Bristol Rd., Waterbury 20, Conn.

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BRISTOL TRAIL-BLAZERS IN PROCESS AUTOMATION

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Communications and Automation

Edited by FRANK CHAPMAN

Cybernetics for pipeliners

By F. VINTON LONG

"CYBERNETICS for Pipeliners" is an old title, one I used for a paper presented at the PIEA Dallas meeting two years ago, but the philosophy expressed there has not changed.

Management of pipelines and particularly gas pipelines should concentrate on the word "Cybernetics" and find out just what it means.

Dr. Norbert Weiner of MIT made the term well-known, and we will see it more and more. It is derived from the old Greek definition of "steersman" and that is a good name for what a pipeline control mechanism should do. It incorporates the use of feedback intelligence, such as the signals you receive from your finger tips when you reach for a pencil. When the pencil is touched, your control gadgets receive word of this, and immediately send forth instructions for your fingers to exert pressure to pick the thing up. It will be the day when we, with all our electronic brains, can do this same simple thing!

The first user of automatic control or the forerunner of the practice of the art of cybernetics was a gentleman in a nightshirt, called a "toga." He was an early Roman and he devised an automatic float switch to control water level in their Roman water tanks. It worked very well.

From there things went on slowly but did not cause any excitement until after World War II, at which time the term "Automation" hit us.

Then things began to pop. Everyone began to think that all things could be done through use of a push button, and these buttons would eliminate manual labor and a lot of workers would be out of a job. This, of course, was not so and instead of lay-offs there were increases in jobs and more goods were manufactured and sold.

The gas pipeline companies during this period were busy taking calculated risks, building pipelines and contracting for gas supply.

During this period there was not time to worry too much about practicing the art of cybernetics. Only in the last year or so has pipeline management had time to catch its breath and think this thing over.

Now we are ready to go, and maybe we all need some fresh thinking about just how to do it.

Lately I have heard several offers from leaders in the field of computing and automatic control to come in and solve gas pipeline problems. Invariably they have underestimated the situation and have discovered that the practice of running an automatic pipeline using the cybernetic theory is not just easy. It is very different from design of a refinery or production unit, or drilling holes in the right place with a machine tool in a factory.

Up to now, little real aid has been received. Most of the dreaming and design has been done by the pipeline engineers.

Many of the computer people do not realize that running an automatic gas pipeline is a peculiar and sensitive operation. They do not know that a major line may have 350 gathering points and 350 sales points, all of which vary constantly in through-put, plus about one-million horsepower in installed gas movers, which is also a complex and dynamic situation when it comes to fuel costs, purchase power contracts, etc.

So the computer experts have quite a chore to do.

The targets are: (1) Provide feedback intelligence from delivery points back to the control center. (2) Provide methods for customer billing from this same facility. To insure against loss through communication failure small computers should be installed on-site with 31-day strip charts which read "BTU SALES." This same "BTU SALES" figure also is transmitted to "FLOW CONTROL" which is at a central point. (3) Take manual data transmission off of the operators back and send it electronically instead of by human voice. (4) Provide a method of deciding which compressors should stay on the line at any given moment. This may be dictated by power or fuel cost, etc. (5) Decide the optimum flow from each purchase point. This is not always easy because contractual agreements creep into the picture. (6) Anticipate sales volume through interpretation of weather forecasts, time of day, holidays, etc. (7) Keep pipeline pressure to optimum level.

The last point should rate a long look. An empty line does nothing but cost money. And if you have an existing line and it becomes undersized because of heavier demand, the remedy is obvious.

I believe computing machine efforts should just be directed to delivery points, then to compressor loading, and lastly to purchase points. The delivery points are easiest to start out on: computers can accomplish two functions with one price of gear, and after all, upon your sales depends the operation of the pipeline.

There has been some talk in the past among pipeline transmission people that the gas distributors are reluctant to accept flow meters, computers, Btu sales meters and other gadgets which as a whole provide automatic pipeline operation.

I say that this just ain't so.

There are flow meters and computing meters available now which will provide safe, accurate control of gas deliveries. And when I heard someone mention that one should check these against conventional orifice meters and manual integrating machines, I cannot help but compare this with the thought that you should check Naval Observatory time signals with your Pocket Ben. Just who is checking who?

It is clear that the distributors and other customers present no problem. It can and will be a cooperative effort to improve gas sale efficiency.

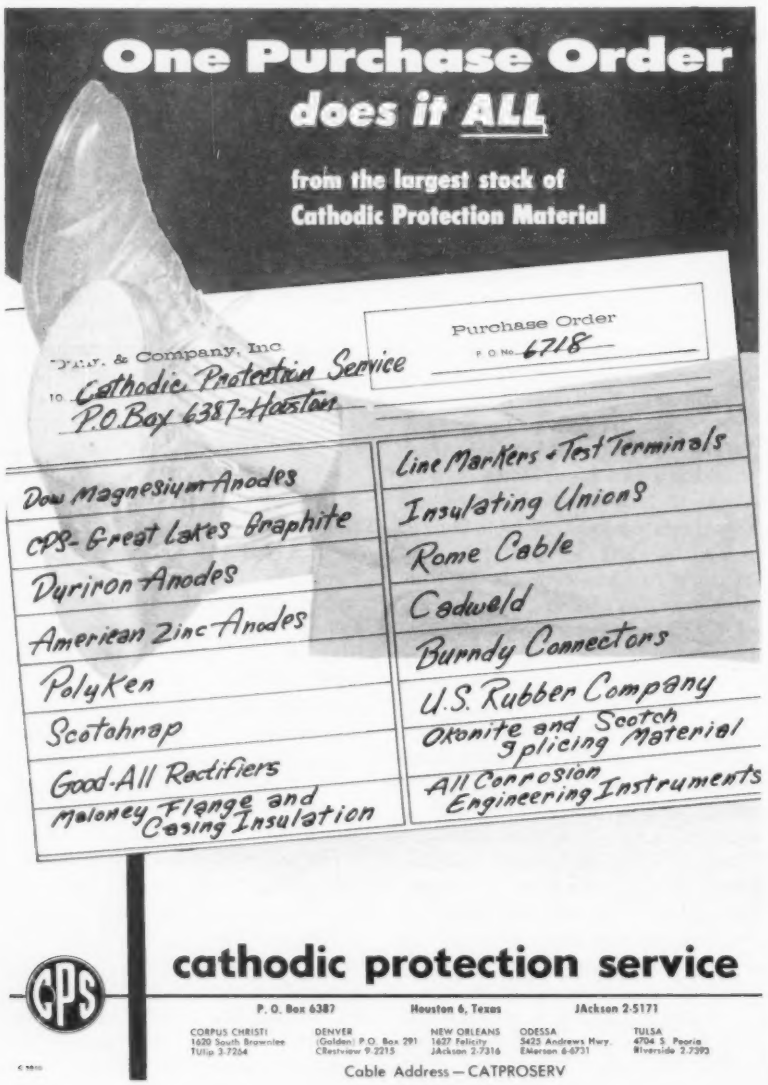
Before "HEADQUARTERS, FLOW CONTROL" can function, someone must figure out a reliable and not-too-expensive means of communication. This is still the weak link in the picture.

Alternate routing techniques provide fail-safe operation on backbone, higher-density communication channels, but it's pretty costly to provide to each sales, compressor, and purchase point.

Because of this, several pipeliners are intent on improving methods of communication. They do this in desperation and not from desire because most pipelines are not in the research business. Two companies have made some progress in this effort and I believe you will hear more of this later.

The communication equipment suppliers are so involved with complicated and costly communication techniques for DEW LINES and EXPLORERS, and other things for our defense, that little money is set up for developing cheap, simple, and reliable telecontrol links for the pipelines.

The expanding use of cybernetics and telecontrol will of necessity bring forth new things in the pipeline communication field. That day is not long off. ■



AT&T rate increases face FCC opposition

The giant American Telephone & Telegraph Co. isn't having much luck in efforts to raise rates for some of its services.

The Federal Communications Commission in two recent actions ruled out a rate increase proposed by AT&T on one of its services, and ordered a rate reduction on another service.

In the rate reduction case, the commission ordered the communications utility to cut its charges for private line telephone service by 15 per cent. These are direct lines used extensively in business between plants, offices, branches, and in service work.

In the other case, the commission turned down a bid by AT&T to increase its rates for leased teletype services used by the press. The increase would have averaged 37 per cent.

The commission had been studying the rates in the two private communications services of the Bell System since 1955.

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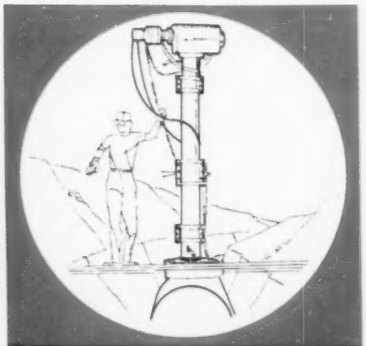

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pipeline news • *Cont'd.*

from page 184

MMcf. Estimated cost of the initial facilities is $161.1 million based on present costs. Expansion is expected to add another $41 million.

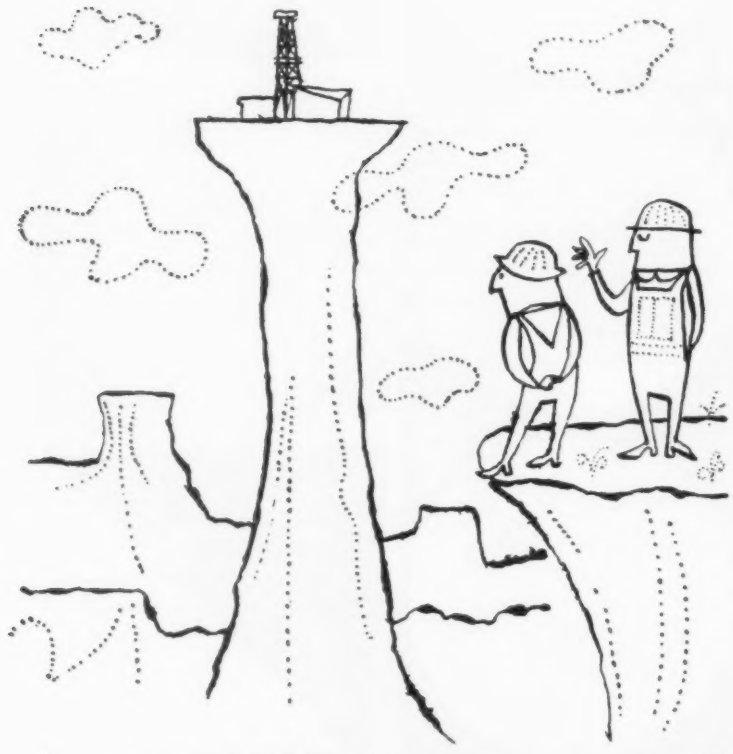
New Texas gathering system planned

A $12 million, 289-mile pipeline system is planned by Coastal States Gas Producing Co., Corpus Christi. Capacity of the line without compression is 289 MMcf daily. With compression, another 200 MMcf will be added. According to Oscar S. Wyatt Jr., head of Coastal States, his company has executed two letters of intent for the sale of gas to Transcontinental Gas Pipe Line Corp. and Texas-Illinois Natural Gas Co.

Louisiana tax warning

Louisiana Governor Earl Long has warned the natural gas industry not to challenge the constitutionality of the state's two-cent gas gathering tax. If it does, the legislature will convene and put the tax on at the wellhead at about double its present rate.

Gov. Long told a press conference that he doesn't think the industry will challenge the tax. "I think the gas people are convinced the state needs the money. Also, if the gas people don't attack it, they'll get some favorable publicity for the future. If they do, they'll get a lot of unfavorable publicity, and I think eventually they'll lose the case, too," he said.



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Oklahoma may close field

Because of low natural gas prices, the Oklahoma Corporation Commission is thinking of closing down the Ringwood gas and oil field.

The commission's attorney said there is precedent for closing down the field on the grounds that gas is being wasted if operators receive only 2 to 3 cents per Mcf. Elsewhere in the state the going price is 8 to 9 cents or above.

GAMA study shows gas pipeline growth

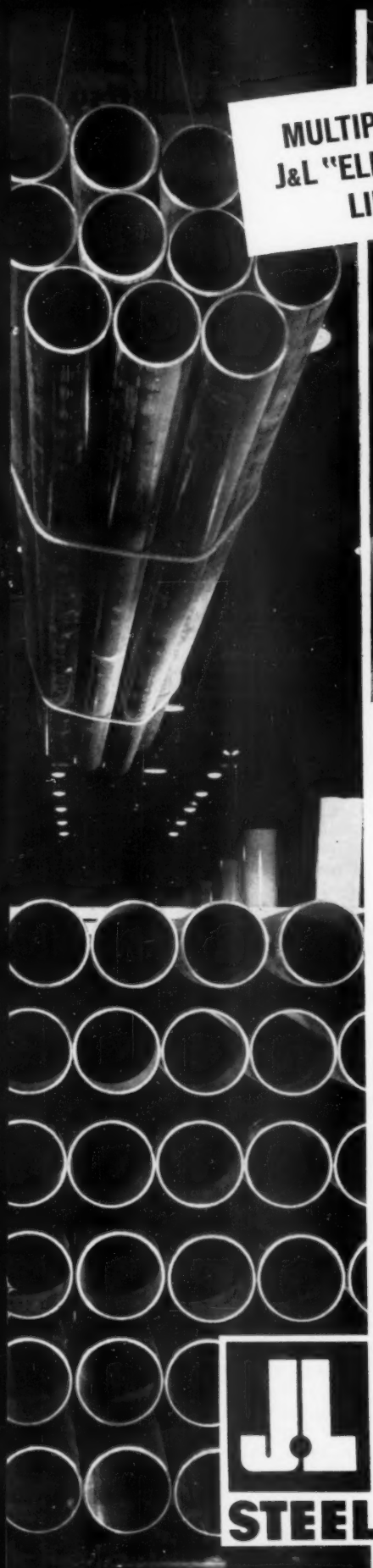
Since 1945 the expansion-minded gas industry has asked the FPC for approval of more than $1.5 billion worth of construction projects —over and above the nearly $6 billion authorized by the commission.

This is revealed in the 1958 edition of "Natural Gas Construction Data" published by GAMA. The story shows that applications for projects totaling $1,334,184,000 were before the commission on Jan. 1, 1958. Additional major applications amounting to $330,496,000, filed between Jan. 1 and April 30, also are detailed in the study.

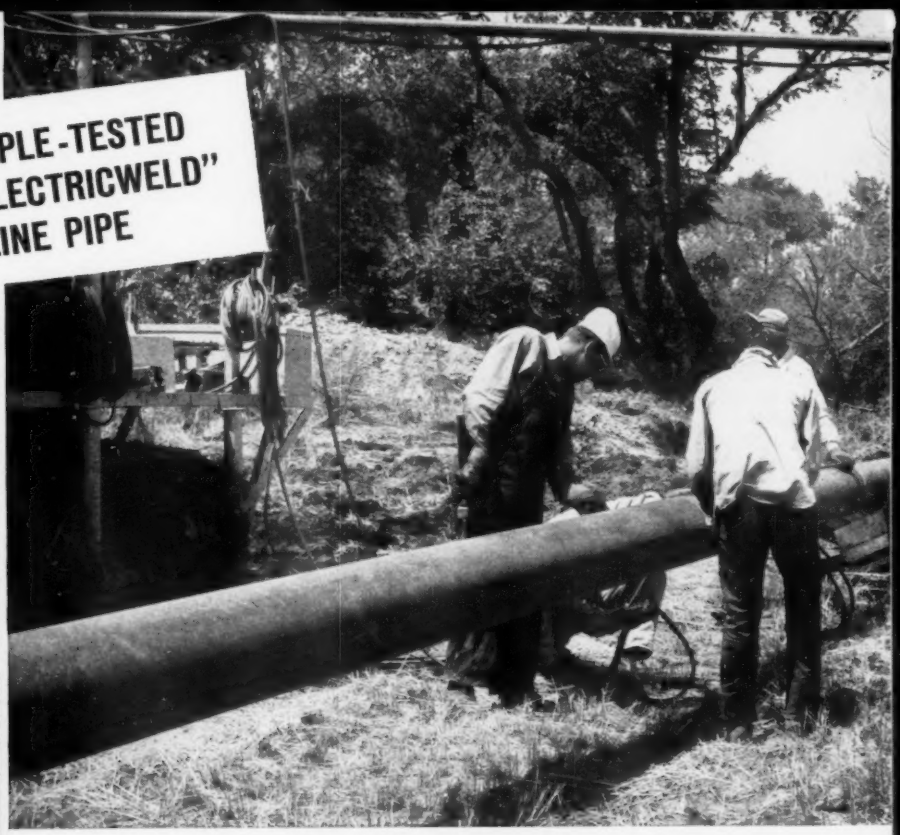
Listed are 149 cities of more than 50,000 population slated to receive new or additional natural gas supplies through transmission projects involved expenditures of $385,506,000 okayed by the FPC during 1957.

The 3356 miles of pipeline approved in 1957 required an estimated 672,087 tons of steel line pipe. Pending applications on Jan. 1 of this year involved 12,121 miles of pipeline and an estimated 2,368,-118 tons of steel.

At the end of 1957, there were 548,820 miles of pipeline system. Of the total, 160,110 miles are transmission lines, 338,690 are dis-



MULTIPLE-TESTED J&L "ELECTRICWELD" LINE PIPE



Welders on this Jayhawk Pipe Line Company installation report J&L Electricweld pipe is easy to weld. They installed 3109 tons of 10¾-inch O.D. and 3172 tons of 12¾-inch O.D. Electricweld pipe in this line. Both sizes are in .250 inch wall and Grade X46.

Jayhawk relies on J&L "Electricweld" line pipe for 78 miles of dependable performance

The Jayhawk Pipe Line Company, Wichita, used 42 miles of 10″ and 36 miles of 12″ J&L Electricweld line pipe in this new line from Plains to Valley Center, in Kansas. They find that J&L Electricweld line pipe bends readily, is uniformly round, is consistently top quality.

Electricweld line pipe is produced by Jones & Laughlin under most rigid quality controls. J&L, an integrated steel company, is able to control quality from ore through finished pipe. J&L takes every step to assure unsurpassed quality and dependability in Electricweld.

Before welding, the skelp edges are blasted with steel grit under 100 psi in a "Vacu-Blast" unit to clean the surface for perfect contact with the welding electrode. Electronic controls maintain exact welding heats at all speeds. After welding and trimming, the pipe passes through an induction annealing unit to assure uniform grain structure in the weld area.

Every length is thoroughly inspected through visual examinations, hydrostatic tests, flattening tests and magnaflux examinations. All J&L Electricweld line pipe is manufactured and tested in strict compliance with appropriate A.P.I. and A.S.T.M. specifications.

Electricweld line pipe is available from 6⅝ inches through 12¾ inches and in lengths to 60 feet. Investigate this superior-quality pipe for your next line. See your distributor, or write to Jones & Laughlin Steel Corporation, 3 Gateway Center, Pittsburgh 30, Pa.

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tribution lines, and 50,020 are field and gathering lines.

GAMA's publication lists the names and addresses of pipeline and utility companies participating in the various pipeline projects, and details the mileage, cost, line sizes, estimated steel pipe tonnage, compressor horsepower, FPC docket number and purpose of each project. Copies are available at $3 per copy from the marketing and statistical department of the association, 60 E. 42nd St., New York 17.

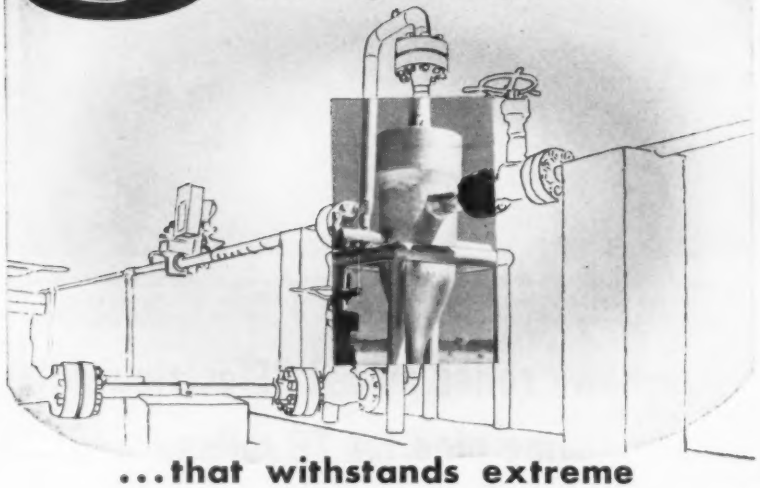
$46.5 million job proposed by El Paso

In an application filed with the FPC recently, El Paso (Texas) Natural Gas Co. seeks to build new facilities to cost $46.5 million (Docket G-15696).

They would be operated in conjunction with its existing facilities and those facilities presently authorized and under construction to supply up to 100 MMcf daily additional gas to Pacific Gas & Electric Co. Delivery point is near Topock, Ariz., on the Arizona-California border.

Included in the facilities are mainline loops, 118.5 miles of 30-in. line, and 24,500 hp compression, including two new 10,000-hp stations. Field facilities include 108.5 miles of 20-in. line and 12,900 additional hp divided among four existing compressor stations.

AEROTEC *Gas Scrubber...*



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When gas is reinjected into wells as a reclaimer, or for storage, it must be free of contamination and must be cleaned at high pressures to remove condensate.

Meeting these demands has required an Aerotec gas scrubber in a special pressure shell. Employing Aerotec centrifugal tubes, this unit operates at 4,000 psig and handles 4,000,000 SCFD of gas!

The Aerotec tube assures removal of solids and liquids by centrifugal force, leaving the gas clean and *dry!* Hundreds of Aerotec gas scrubbers are in continuous use on major pipelines. They are the only answer to clean, *dry* gas.

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SRS • Pipeline Notes

Work is under way on New York State Natural Gas Corp.'s recently authorized 29.5-mile line (Docket G-14956). When completed, the line will supply more gas for Buffalo, Niagara Falls, Dunkirk, Hamburg, and neighboring western New York communities. Estimated cost of the 20-in. line together with two metering and regulating stations, was put at $1.6 million.

Permian Basin Pipeline Co., Omaha, seeks FPC authority (Docket G-13792) to buy gas from the Emperor field in Winkler county, Texas. About 60.9 miles of 16-in. lateral supply lines and 11.3 miles of various diameter field lines are included in the $3.6 million job.

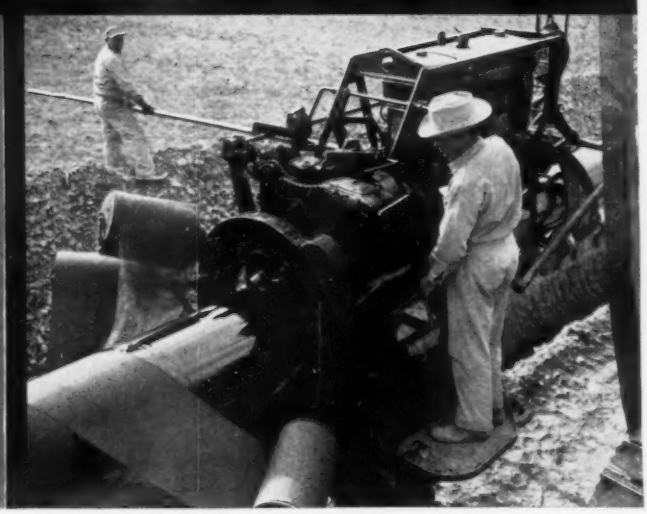
FPC has adopted a presiding examiner's decision directing Atlantic Seaboard Corp., Charleston, W. Va., to provide natural gas service to Blue Ridge Gas Co., Harrisonburg, Va. (Docket G-14422). Atlantic Seaboard was ordered to deliver up to 779,584 Mcf annually to Blue Ridge, with peak day deliveries not to exceed 2,040 Mcf.

Texas Gas Transmission Corp., Owensboro, Ky., has FPC's okay (Docket G-14763) to spend some $725,500 for new facilities in Jefferson Davis and Acadia parishes, La. Texas Gas will construct 12.5 miles of 16-in. loops from the Lake Arthur field to an interconnection with its 26-in. Eunice-Bastrop line near Eunice, La.

Tennessee Gas Transmission Co., Houston, recently filed a registration statement with the SEC covering an offering of $50 million of first mortgage pipeline bonds due in 1979. President Gardiner Sy-

From the day we produce them . . .

. . . till the day you apply them . . .



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3. Experienced Sales Service *Pitt Chem* sales representatives are experienced coating men. They talk your language, will help you plan the many requirements of your coating job.

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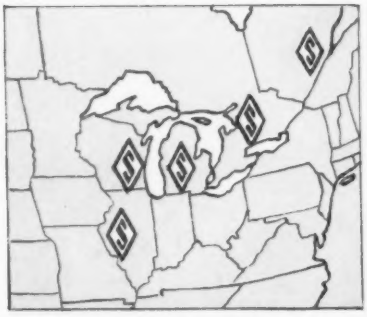

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pipeline news • *Cont'd.*

monds said net proceeds will be used in the payment of short term notes and for future expansion.

Consolidated reopened proceedings involving El Paso Natural Gas Co.'s gas reserves and its Aneth field project are underway (Dockets G-13862 and 12580). Earlier the FPC has granted the company temporary authority to construct and operate $14 million facilities to acquire gas from the Aneth field area of Utah, Colorado, New Mexico, and Arizona.

El Paso (Texas) Natural Gas Co. is seeking a permit for $4.8 million facilities to acquire gas from the East Maljamar and Kemnitz areas in Lea county, N. M. (Docket G-15068). The proposed facilities include acquisition of a 3520-hp compressor station from Tennessee Gas Transmission, installation of 4650 hp in two new compressor stations, 39.3 miles of field lines, and 16.7 miles of fuel pipeline. Approximately 27 MMcf daily would be bought from Phillips Petroleum Co.

Tennessee Gas Transmission Co.'s request to withdraw its application for compressor station in Pennsylvania has been granted by the FPC (Docket G-15037). Originally, TGT planned to construct a 6000-hp station to increase storage service to Brooklyn Union Gas Co. and Consolidated Edison Co. TGT filed its withdrawal request when the storage-service agreement contract was cancelled at the request of Brooklyn Union and Con Edison.

Pacific Northwest Pipeline Corp., Salt Lake City, got FPC's go-ahead on its plan to loop its existing Big Piney lateral (Docket G-14561). At a cost of approximately $5.5 million, PNW will install 51.3 miles of 30-in. in Lincoln and Sublette counties, Wyo. It will enable the company to receive gas purchased from independent producers in the Big Piney and Tip Top-Hogsback fields.

Financial reports on operations of gas transmission lines in the first half of '58 are in sharp contrast with oil company reports. For the most part the gas pipelines recorded healthy increases in net incomes. Most oil operators recorded sharp declines. Expanded facilities and increased sales brought record sales to several transmission companies.

An oil and gas concession of nearly 1.5 million acres has been acquired by Tennessee Gas Transmission Co. in west central Ecuador. Operator of the concession will be TGT's wholly owned subsidiary, Tennessee del Ecuador S. A.

Westcoast Transmission Co., Ltd., Calgary, is planning an expansion program that will include an increase in both its purchases of gas and its sales in present markets. President Frank M. McMahon told stockholders that the company's line was built to carry much larger volumes of gas than it is doing now.

Headquarters of the Little Big Inch Division of Texas Eastern Transmission Corp. are now located in the Memorial Professional building in Houston.

F. H. Maloney Co., Houston, has appointed Frost Engineering Service Co. as exclusive southern California distributor. Frost has offices in Los Angeles and warehouse facilities in Huntington Park.

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